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Oceans and the law of the sea

Report of the Secretary-General

Addendum

Summary

The present addendum has been prepared in response to a request by the General Assembly, in paragraphs 91 and 92 of its resolution 61/222, for the Secretary-General to report to the Assembly at its sixty-second session on issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction, in the context of his report on oceans and the law of the sea. As provided in that resolution, the report is intended to assist the second meeting of the Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction, to be convened in 2008, in preparing its agenda. In accordance with paragraph 92 of resolution 61/222, the report presents information on: the environmental impacts of anthropogenic activities on marine biological diversity beyond areas of national jurisdiction; coordination and cooperation among States as well as relevant intergovernmental organizations and bodies for the conservation and management of marine biological diversity beyond areas of national jurisdiction; the role of area-based management tools; genetic resources beyond areas of national jurisdiction; and whether there is a governance or regulatory gap, and if so, how it should be addressed.

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Abbreviations

CCAMER	Commission for the Conservation of the Marine Environment
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COFI	FAO Committee on Fisheries
EEZ	exclusive economic zone
FAO	Food and Agriculture Organization of the United Nations
GDP	gross domestic product
GEF	Global Environment Facility
GESAMP	Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities
ICRI	International Coral Reef Initiative
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission of UNESCO
IUCN	World Conservation Union
IUU fishing	Illegal, unreported and unregulated fishing
LME	large marine ecosystem
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto
MPA	Marine protected area
NAFO	North-West Atlantic Fisheries Organization
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PSSA	Particularly Sensitive Sea Area
RFMOs/As	Regional fisheries management organizations and arrangements
SEAFO	South-East Atlantic Fisheries Organization
SPAMI	Specially Protected Area of Mediterranean Interest
UNCLOS	United Nations Convention on the Law of the Sea
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme

UNESCO	United Nations Educational, Scientific and Cultural Organization
UNU	United Nations University
WIPO	World Intellectual Property Organization
WMO	World Meteorological Organization

I. Introduction

1. The oceans are characterized by a very high, diverse, abundant and dynamic biological diversity ("biodiversity"), including a large portion of the planet's living organisms, both within and beyond areas of national jurisdiction. While micro-organisms are the most genetically diverse marine organisms and dominate the oceans' biomass, marine macro-organisms' diversity is also high. The greatest — and most accessible — diversity is in coastal areas, but other areas are also highly diverse. Marine habitats and ecosystems are also extremely diverse, ranging from pelagic ecosystems to deep seabed features, such as hydrothermal vents and abyssal plains.

2. The development of new sciences and technologies, particularly those associated with deep sea ecosystems, and growing scientific and commercial interest have spurred an increase in human activities related to the oceans, and their biodiversity and biological resources, which include genetic resources.[1] At the same time, concerns about the health and sustainability of marine ecosystems and associated biodiversity are being raised, including most recently in *The Millennium Development Goals Report 2007*.[2] While the greatest intensity of human activities and pressures on marine biodiversity are in coastal areas under national jurisdiction, increasing attention is being paid to the important role of marine biodiversity beyond areas of national jurisdiction, both in relation to its value, uses and vulnerabilities.

3. As a result, various efforts have been initiated at the international level[3] to address the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction. In particular, in 2004, the General Assembly established, by paragraph 73 of resolution 59/24, the Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction (hereinafter the "Working Group"). At its first meeting, held in New York from 13 to 17 February 2006, the Working Group had the mandate: (a) to survey the past and present activities of the United Nations and other relevant international organizations with regard to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction; (b) to examine the scientific, technical, economic, legal, environmental, socio-economic and other aspects of these issues; (c) to identify key issues and questions where more detailed background studies would facilitate consideration by States of these issues; and (d) to indicate, where appropriate, possible options and approaches to promote international cooperation and coordination for the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction. The Working Group was assisted in its

[1] For a definition of "biological diversity", "biological resources", "ecosystems" and "genetic resources", see art. 2 of the Convention on Biological Diversity. See also A/60/63/Add.1, paras. 4-8.

[2] *The Millennium Development Goals Report 2007* notes that even though more areas, on land and in the sea, are being protected, the proportion of species threatened with extinction continues to increase and individual populations continue to decline. Unprecedented efforts will be required to conserve habitats and to manage ecosystems and species in a sustainable way if the rate of species loss is to be significantly reduced by 2010. The report is available from http://www.un.org/millenniumgoals.

[3] These efforts include developments in relevant forums, such as the Convention on Biological Diversity, FAO, etc. For additional information, see A/60/63/Add.1, paras. 226-304.

consideration of these issues by a report prepared by the Secretary-General pursuant to paragraph 74 of General Assembly resolution 59/24 (A/60/63/Add.1).

4. Delegations at the first meeting of the Working Group reaffirmed that the United Nations Convention on the Law of the Sea (UNCLOS) provided the legal framework for all activities in the oceans and seas and that any action relating to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction should be consistent with its legal framework. In addition, it was recognized that the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction needed to be approached in an integrated manner, on the basis of precautionary and ecosystem approaches to ocean management. The Working Group provided a unique opportunity to facilitate work in this area, in a comprehensive manner.[4]

5. In 2006, the General Assembly decided, in resolution 61/222, paragraph 91, to convene, in accordance with paragraph 73 of resolution 59/24, another meeting of the Working Group in 2008 to consider: (a) the environmental impacts of anthropogenic activities on marine biological diversity beyond areas of national jurisdiction; (b) coordination and cooperation among States as well as relevant intergovernmental organizations and bodies for the conservation and management of marine biological diversity beyond areas of national jurisdiction; (c) the role of area-based management tools; (d) genetic resources beyond areas of national jurisdiction; and (e) whether there is a governance or regulatory gap, and if so, how it should be addressed. In paragraph 92 of the same resolution, the General Assembly requested the Secretary-General to report on the above-mentioned issues at its sixty-second session in order to assist the Working Group in preparing its agenda, in consultation with all relevant international bodies.

6. The present report has been prepared in response to the request of the General Assembly to the Secretary-General. Chapters II to VI thereof, respectively, address the issues indicated in paragraph 5 above. The report contains information provided by States and relevant international organizations following an invitation by the Secretariat to submit information on the nature and extent of coordination and cooperation among States as well as relevant intergovernmental organizations and bodies for the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction (General Assembly resolution 61/222, para. 91 (b)). Information was received from the following States: Canada, Ecuador, Mexico, Norway, Panama and Peru. The secretariats of the Convention on Biological Diversity and of the Convention on the Conservation of Migratory Species of Wild Animals, the Food and Agriculture Organization of the United Nations (FAO), the Intergovernmental Oceanographic Commission (IOC) of the United Nations Educational, Scientific and Cultural Organization (UNESCO), the North Pacific Anadromous Fish Commission, the North Atlantic Salmon Conservation Organization, the United Nations University (UNU) Institute of Advanced Studies and the World Bank also submitted information to be included in the present report.

7. The present addendum should be read in conjunction with recent reports of the Secretary-General on oceans and the law of the sea (A/60/63/Add.1, A/61/63 and Add.1, and A/62/66 and Add.1), the reports of the Secretary-General on sustainable

[4] See the report of the Working Group (A/61/65), and in particular paras. 3 and 5 of the summary of trends prepared by the Co-Chairpersons, contained in annex I, as well as para. 5 of the Co-Chairpersons' summary of discussions.

fisheries (in particular A/61/154 and A/62/260), the report of the Ad Hoc Open-ended Informal Working Group to study issues relating to the conservation and sustainable use of marine biological diversity in areas beyond national jurisdiction (A/61/65), and the report on the work of the United Nations Open-ended Informal Consultative on Oceans and the Law of the Sea (the "Consultative Process") at its eighth meeting (A/62/169), where the topic of focus was "Marine genetic resources". Also relevant are past reports of meetings of the Consultative Process during which issues relevant to the conservation and sustainable use of marine biodiversity, including in areas beyond national jurisdiction,[5] were discussed.

II. The environmental impacts of anthropogenic activities on marine biological diversity beyond areas of national jurisdiction

8. In its report *A Sea of Troubles*,[6] the Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) noted that the state of the world's seas and oceans was deteriorating and that new threats kept emerging, undermining benefits to humanity. That statement was echoed at the first meeting of the Working Group during which it was noted that various "anthropogenic" (or "human-induced") activities posed serious threats to marine ecosystems, and that environmental impacts and their associated socio-economic aspects needed to be studied and better understood. This would allow for mitigation measures and other conservation actions to be appropriately taken in order to protect not only biodiversity (including beyond areas of national jurisdiction), but also the sustained livelihood of millions of people dependent on a healthy marine environment for the continuation of their activities.

9. The main current and foreseeable activities and phenomena that have or could have an impact on marine biodiversity include overfishing, destructive fishing practices, pollution, introduction of invasive alien species, mineral exploration and exploitation, marine debris, marine scientific research, anthropogenic underwater noise, climate change, waste disposal and carbon sequestration (see A/60/63/Add.1, paras. 128-175). In particular, fishing and shipping, two important activities in the oceans, have been growing at an unprecedented scale (see paras. 14-27, 31-35, 42-43 and 47 below), thereby adding stresses to the marine environment.

10. Over the last few years, our understanding of the impacts of anthropogenic activities on marine biodiversity has increased. Science and technology have opened up new frontiers in the oceans. What was once regarded as featureless, unchanging and inexhaustible is now known to be complex, dynamic and finite. These same

[5] "Responsible fisheries and illegal, unregulated and unreported fisheries, and economic and social impacts of marine pollution and degradation, especially in coastal areas" (A/55/274), "Protection and preservation of the marine environment" (A/57/80), "Protection of vulnerable marine ecosystems; and safety of navigation" (A/58/95), "New sustainable uses of the oceans, including the conservation and management of the biological diversity of the seabed in areas beyond national jurisdiction" (A/59/122), "Fisheries and their contribution to sustainable development; and marine debris" (A/60/99), "Ecosystem approaches and oceans" (A/61/156), and "Marine genetic resources" (A/62/169).

[6] Joint Group of Experts on the Scientific Aspects of Marine Environment Protection, 2001 (GESAMP) Reports and Studies No. 70 (The Hague, 2001).

advances are also increasing human impacts on remote, deep and little known areas.[7] Once limited largely to shipping and high seas fishing, commercial activities at sea are expanding rapidly and plunging ever deeper. Deep sea fishing, marine scientific research and energy development, are already taking place at significant depths. Military operations and seismic exploration have also intensified throughout the oceans, with growing impacts on deep water and high seas ecosystems and biodiversity. While the prospects of commercial deep sea bed mining are still uncertain, efforts worldwide to develop the deep sea resources facilitated by advances in technologies (see A/60/63/Add.1, paras. 58-97) are likely to grow more systematically (see http://www.isa.org.jm/files/documents/EN/Brochures/ENG1.pdf).

11. These multiple and multiplying activities, which provide a number of services to the planet and its people, are generating growing concerns among the international community about their potential adverse impacts on marine ecosystems (see A/60/63/Add.1, paras. 128-175). In addition, climate change and its impacts, such as ocean warming and acidification, underscore the need to reduce direct human impacts so that healthy ecosystems can better respond to changing oceanic conditions.

12. Science and scientists are progressively filling knowledge gaps about how human activities affect marine biodiversity. However, because of the scales and complexities involved, research is often difficult, expensive and lengthy (ibid., para. 57). As indicated in paragraphs 106 and 107 below, the regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects, provides a potential mechanism for increased research and collection of information, including in relation to marine biodiversity beyond areas of national jurisdiction. In addition, taking into account that the conservation of marine biological resources and their sustainable use are closely interrelated (ibid., para. 129), research projects require integrated approaches with multidisciplinary research efforts. This can only be achieved through cooperation among all relevant stakeholders. It is therefore important to recall that conservation and sustainable use of marine biodiversity require precautionary and ecosystem approaches. Further, the conduct of prior environmental impact assessments is a prerequisite to the development of new activities, as well as regular monitoring.

13. The present chapter presents a description of the activities taking place in the oceans, including beyond areas of national jurisdiction, and the corresponding environmental impacts which are either already known to occur, or are assumed or projected to occur in the case of new and emerging activities. Some of these activities are taking place in areas within national jurisdiction and have transboundary impacts which can also affect biodiversity beyond areas of national jurisdiction. The chapter only provides brief references to relevant principles and the provisions of legal instruments, as necessary, as these have already been covered in previous reports of the Secretary-General (see para. 7 above).[8]

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[7] *Ecosystems and Biodiversity in Deep Water and High Seas*, UNEP Regional Seas Report and Studies UNEP/UCN, No. 178 (Switzerland 2006).

[8] These reports include relevant developments within competent intergovernmental organizations in order to address anthropogenic activities and their impacts on marine biodiversity. See also A/58/65, A/59/62, A/60/63, as well as A/60/189, A/CONF.210/2006/1, and A/62/260.

A. Impacts of overfishing, illegal, unreported and unregulated fishing and destructive fishing practices

14. Millions of people around the world depend on fisheries and aquaculture, directly or indirectly, for their livelihoods. The fisheries sector, including aquaculture, is an important source of employment and income. During the past three decades, the number of fishers and aquaculturists has grown faster than the world's population, and employment in the fisheries sector has grown faster than employment in traditional agriculture. The share of fish trade in both total gross domestic product (GDP) and agricultural GDP has roughly doubled over the past 25 years. The fishery net exports of developing countries have shown a continuing rising trend over the past two decades, growing from 4.6 billion United States dollars in 1984 to $20.4 billion in 2004. These figures are significantly higher than those for agricultural commodities such as rice, coffee and tea.[9] The fishing industry also generates considerable employment in shipbuilding and shipyard operations, the fishing gear industry, the production of technological equipment, aquaculture feed production, and processing, packaging and transport.

15. According to preliminary FAO estimates based on reporting by some major fishing countries, total world fishery production reached almost 142 million tons in 2005, representing an increase of over 1 million tons compared with 2004, and a record high production. The total amount of fish available for human consumption was estimated to have increased to 107 million tons.[9]

16. As a main source of food for many, it may not be surprising therefore that the dominant human-induced direct impacts on marine biodiversity, including in areas beyond national jurisdiction, are those associated with fishing (see A/61/154).

17. Unsustainable fishing practices and their impacts on the health and productivity of marine ecosystems have become an increasing concern for the international community. Agenda 21, the programme of action adopted at the United Nations Conference on Environment and Development,[10] identified in paragraph 17.45 the following main problems affecting high seas fisheries: illegal, unreported and unregulated fishing (IUU fishing); overcapitalization and excessive fleet size; vessel reflagging; insufficiently selective fishing gear; excessive by-catch; lack of enforcement of conservation measures; unreliable databases; and lack of sufficient cooperation between States. Most of these issues arise from the open access nature of high seas fisheries, which encourages "free riders", does not favour meaningful cooperation among States, and prevents an effective management of high seas fisheries. Yet, without effective management, fishery resources are overexploited and depleted, inhibiting possibilities for sustainable development (see A/60/63, para. 210).

18. *IUU fishing*. Many fish stocks have been undermined by high levels of IUU fishing, carried out by fishing vessels that are not subject to effective flag State control. The problem has been reported in many regions of the world, affecting both areas within and beyond national jurisdiction. In this respect, IUU fishing has

[9] FAO, *The State of the World Fisheries and Aquaculture 2006*, FAO Fisheries and Aquaculture Department (Rome, 2007), available from http://www.fao.org.

[10] *Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992* (United Nations publication, Sales No. E.93.I.8 and corrigenda), vol. I: *Resolutions adopted by the Conference*, resolution 1, annex II.

adverse effects on the conservation of fishery resources, economies and food security of coastal States, and is routinely associated with unsustainable fishing on the high seas, particularly in areas that are not regulated by regional fisheries management organizations and arrangements (RFMO/As).

19. It is well recognized that IUU fishing constitutes a major impediment to the achievement of long-term sustainable fisheries, as called for in various international fishery instruments. Increases in demand for fish and fish products have made such unsustainable fishing practices lucrative and attractive to unscrupulous operators and vessel owners (see also paras. 305-307 below).[11]

20. *Overfishing*. With regard to overfishing, a most recent report of FAO on the state of the world's fisheries and aquaculture[9] pointed out that the overall state of exploitation of the world's marine fishery resources has tended to remain relatively stable.[12] However, it was estimated that in 2005, as in recent years, only around one quarter of the stocks monitored by FAO were underexploited or moderately exploited and could perhaps produce more, whereas about half of the stocks were fully exploited and therefore producing catches that were at, or close to, their maximum sustainable yields, with no room for further expansion. The remaining stocks were overexploited, depleted or recovering from depletion and thus yielding less than their maximum potential owing to excess fishing pressure. In addition, while it was recognized that the health of aquatic ecosystems was critical to the health of a fishery, there was also evidence that fisheries exploitation affected not only target stocks and other fish species, but also communities or organisms, ecological processes and entire ecosystems thereby causing decreased diversity or productivity (see A/61/154, para. 26). Indirect effects of fishing resulted in changes in marine ecosystems affecting, for example, predator-prey relationships, population size, body size and the composition of species.[13]

21. According to FAO, the situation seems more critical for some highly migratory, straddling and other fishery resources that are exploited solely or partially in the high seas, in particular, straddling stocks and highly migratory oceanic sharks. Nearly two thirds of straddling stocks and other high seas fishery resources were classified as overexploited or depleted; and more than half of highly migratory oceanic sharks were listed as overexploited or depleted.

22. The findings of FAO confirm earlier observations that the maximum wild capture fishery potential from the world's oceans had probably been reached and reinforce calls for more cautious and effective fisheries management to rebuild depleted stocks and prevent the decline of those being exploited at or close to their maximum potential.

23. *Destructive fishing practices and vulnerable marine ecosystems*. Even if target species are not being overfished, some fishing practices affect marine habitats and

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[11] Progress report on the Implementation of the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing (C 2003/21), Food and Agriculture Organization of the United Nations, Rome, 2003.

[12] Over the past 10 to 15 years, the proportion of overexploited and depleted stocks has remained unchanged, after showing a marked increase during the 1970s and 1980s. It should be noted that when analysing catch trends for individual species, a trend may be altered either by underestimation caused by a portion of catchers being reported at the unspecified level, or, conversely, by improvements in the species breakdown being used to report catch statistics.

[13] For more information on the indirect effects of fishing, see A/61/154, para. 28.

can alter the functioning, state and biodiversity of marine ecosystems, particularly vulnerable marine ecosystems. Some fishing gear, such as bottom trawling and dredging, demersal longlining, and the use of bottom-set gill nets and pots and traps have been found to cause direct and indirect harm to fish stocks and vulnerable marine ecosystems. Ghost fishing by lost or discarded fishing gear can also cause impacts (ibid., paras. 24-56).

24. In this regard, concerns have been raised over the sustainability of target fish stocks, in particular, bottom-dwelling species on the high seas. As deep water species are adapted to an environment where disturbance may be weaker or rarer than in the more shallow water ecosystems, a reduction of adult biomass by fishing may have a stronger negative effect on deep sea fish species than for species on the shelf. Deep water sharks, in particular, have low fecundity and long lifespans and are particularly vulnerable to overfishing. Also, the aggregating characteristics of some deep sea fish species around marine habitats, such as seamounts, for feeding and spawning purposes render those fish species more vulnerable to fishing (ibid., paras. 41-45).

25. With respect to bottom fishing, the inadequate selectivity of trawl nets has an impact, not only on target species (through capture of juveniles), but also on non-target species, whether discarded or not. Affected by-catch species include not only benthic invertebrates and fish species, but also migrating cetaceans, seabirds and deep sea sharks. Bottom fishing may also have a physical impact on the seabed and its fauna[14] resulting in damage to vulnerable ecosystems which constitute critical habitats for marine species (ibid., paras. 29-55). Deep sea habitats are particularly sensitive to anthropogenic disturbance owing to the longevity, slow growth, low reproductive rates and endemism of the species in these habitats, their susceptibility to increased sedimentation and their fragility and limited ability to recover from physical fragmentation caused by bottom fishing. A large number of studies have documented the effects of mobile fishing gear on benthic habitat, including the loss of habitat complexity, shifts in community structure and changes in ecosystems processes (ibid., para. 50).

26. While fishing activities can directly affect marine ecosystems, fisheries provide, at the same time, a source of livelihood to millions of people worldwide. Therefore the challenge for the conservation and sustainable use of marine living resources is to balance the patterns and scale of the impacts of fishing activities.[9] In paragraph 1 of resolution 61/105, the General Assembly reaffirmed the importance it attaches to the long-term conservation, management and sustainable use of marine living resources of the world's oceans and seas as well as the obligation of States to cooperate to this end, in accordance with international law as reflected in the relevant provisions of UNCLOS and, where applicable, the 1995 Fish Stocks Agreement (see A/62/66).

27. The problems relating to the conservation and sustainable use of marine living resources, including overfishing, destructive fishing practices and vulnerable marine ecosystems, and IUU fishing, are addressed in numerous international binding and voluntary instruments. There are also ongoing efforts by regional fisheries bodies

[14] For example, a review prepared for the FAO Commission on Genetic Resources for Food and Agriculture at its eleventh session indicated that several traits of deep water species make them more vulnerable to extinction than shelf species, in particular those that aggregate on seamounts. (Contribution of FAO to the present report).

and States acting through cooperative mechanisms such as RFMO/As to adopt measures to address these problems (see paras. 145-147 and 289-307 below).

B. Pollution, invasive alien species and marine debris

28. Historically, pollution has been a major issue of concern regarding the state of the oceans. The world's oceans have been perceived as a sink with an infinite capacity for absorbing waste, and were commonly used to dispose of waste materials. Many of the substances released into the marine environment were toxic to living resources and a cause of degradation of their habitats.

29. Pollution can take the form of both chemical and solid waste. These substances diffuse through large volumes of water, which makes them less concentrated and more dispersed. Chemical pollution can take the form of trace metals such as lead, mercury, cadmium, copper, zinc, iron and arsenic; petroleum products, namely oil from spills and chronic seepage; radioactive forms of hydrogen, carbon, potassium, and uranium; and synthetic organic compounds such as polychlorinated biphenyls (PCBs), dichlorodiphenyl-trichloroethane (DDT), and hexachlorohexane (HUH).[15] These substances are toxic to the environment and are harmful to biological processes and thus can result in biodiversity loss. Solid waste mostly takes the form of plastics, metal, paper, and glass thrown or washed into the oceans in mass quantities. Because of its strength, durability and buoyancy, plastic makes up the greater part of all debris found in the oceans and is considered by far the most harmful. Marine mammals, birds, turtles, fish, and crabs can often become entangled in plastic loops, strings and bands that can wound them or prevent them from moving. Marine animals are also very susceptible to ingesting all forms of plastic (see para. 45 below).

30. In this respect, the primary threat to the health, productivity and biodiversity of the marine environment results from human activities on land, in coastal areas and further inland. In particular, marine debris, nutrient overenrichment, sewage and management of municipal wastewater, and physical alteration and destruction of habitats continue to be particular causes for concern.[16] Since the distribution of pollutants depends on currents and winds, factors which are impossible to control, pollution along coastlines can be transported offshore, including beyond areas of national jurisdiction, and therefore affect biodiversity in those areas.

31. *Shipping activities*. The considerable growth of maritime commerce represents a heightened risk to marine biodiversity both within and beyond areas of national jurisdiction and has been of growing concern.[17]

32. Threats to marine biodiversity from shipping activities can arise from: (a) accidents (e.g., groundings, spills and collisions); (b) operational discharges (e.g., oil, noxious liquid substances (chemicals), harmful substances carried in bulk, sewage and garbage); (c) air emissions; and (d) physical damage to marine habitats, such as coral reefs or organisms (e.g., damage caused by anchors, ship strikes of marine mammals or the smothering of species/habitats). Normal shipping operations

[15] See A/60/63/Add.1, para. 154, on non-point source pollution.

[16] UNEP/GPA, *The State of the Marine Environment: Trends and processes* (The Hague, September 2006).

[17] Contribution of the World Bank to the present report.

can also be responsible for the introduction of invasive alien species into the marine environment. Furthermore, the use of toxic anti-fouling paints on ships' hulls seriously harms marine life. Damage to marine biodiversity can also be caused by illegal discharges.

33. In shipping, oil pollution arising from ship groundings and collisions or illegal discharges is a major international concern. In terms of tonnage, oil is the main pollutant entering the marine environment resulting from shipping operations. It is introduced predominantly as a result of routine tanker operations, such as discharges from machinery waste and tank washings. It is estimated that the amount of oil spills from ships has declined dramatically since the 1970s.

34. The problem of invasive alien species is ranked second to habitat loss as the major threat to biodiversity, and there is growing evidence that the rate of invasion is accelerating with the expansion of international trade.[18] Every day, it has been estimated that at least 7,000 different species are being transported around the world in ships' ballast tanks (see http://globallast.imo.org). Pending the development of appropriate technologies to achieve the ballast water performance standard required by the International Convention for the Control and Management of Ships' Ballast Water and Sediments,[19] ballast exchange on the high seas continues to be promoted in order to prevent the spread of harmful aquatic organisms and pathogens. Other species enter the sea after escaping or being released from aquaria and fish farms (see also para. 46 below).

35. As regards shipping activities, in addition to the provisions of UNCLOS regarding the protection and preservation of the marine environment, and those contained in other international instruments, the International Maritime Organization (IMO) continues to develop measures to enhance the implementation of international rules and standards, including those aimed at strengthening flag State implementation. At the same time, efforts have also been made to strengthen port State control (see also paras. 179-180 and 323-325 below).

36. *Offshore oil and gas*. With the increasing demand for oil and gas, offshore exploration and development have shifted to remote areas where few search and discovery activities have taken place so far, into the deep water provinces and selected areas where salt strata once obscured what lay beneath. Currently, oil and gas development has already taken place below a depth of 3,000 metres, such as in the Gulf of Mexico.

37. One of the most dangerous and controversial aspects of oil and gas extraction is "flaring", which is a common practice used to burn off gas to test a well's potential, to deal with a malfunction at the well or to separate gas from oil deposits. According to research, the emissions released from flaring contain more than 250 toxic compounds including sulphur dioxide, benzene, nitrogen oxide and toluene. These pollutants can travel 300 kilometres downwind. It is estimated that a single offshore rig emits the same quantity of pollution as 7,000 cars driving 50 miles per day (see http://www.livingoceans.org/oilgas/impacts.shtml).

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[18] The Global Environment Facility has identified the greatest threat to the marine environment from shipping activities as arising from the introduction of invasive alien species through ships' ballast water.

[19] International Maritime Organization document BWM/CONF/36, annex.

38. In addition, it is estimated that a single production platform can drill 50 to 100 wells and discharge over 90,000 metric tons of drilling fluids and metal cuttings into the ocean in its lifetime. Some drilling contractors are using less toxic substances in drilling fluids and some even use water-based drilling muds. But it is estimated that even the less toxic drilling muds can reduce the health, reproductive success and survival rate of scallops, for example (ibid.).

39. *Marine debris*. Marine debris is found in all sea areas of the world and may be found near the source of input (e.g., close to densely populated regions), but can also be transported over long distances by ocean currents and winds.[20] Marine debris is a visible sign of human impact on the marine environment and a source of public concern, as it causes environmental, economic, health and aesthetic problems.[21] It has become an increasing problem in recent years and has come to the attention of the international community (see General Assembly resolutions 60/30 and 61/222, in particular). Problems associated with marine debris include ghost fishing (see para. 23 above) (the entanglement of fish and marine mammals in lost fishing gear) by lost gill nets, bottom longlines and traps and pots. FAO concluded in its study on marine litter and abandoned/lost fishing gear, prepared in collaboration with the United Nations Environment Programme (UNEP), that while there was a need to address the lack of scientific information on the issue, derelict or abandoned/lost fishing gear, remained a serious global problem causing significant ecological, biological, economic and amenity impacts (see A/62/66, para. 118).

40. Marine debris mostly consists of material that degrades slowly, if at all, so that a continuous input of large quantities of these items results in a gradual build-up in the coastal and marine environment. It may be constituted of broken glass, medical waste, ropes, fishing gear and related marine debris (see A/60/63, para 242). All these materials pose a threat to human health and safety and can result in destruction of habitats, become a home for invasive alien species and are also a problem for fishing (commercial fishing, in particular) and navigation.

41. Marine debris comes from both sea-based sources and land-based sources. It is generally acknowledged that land-based sources account for 60 to 80 per cent of marine debris. The main sources of marine debris differ from region to region and from country to country.

42. The main sea-based sources of marine debris are constituted by accidental, deliberate or routine discharges or dumping from ships, pleasure craft, fishing vessels and offshore oil and gas installations and structures. It is estimated that shipping contributes 10 to 20 per cent of the world's marine debris, with larger vessels typically generating the most amounts of waste, from 1.4 to 2.5 kilograms of wet garbage and 0.5 to 1.5 kilograms of dry garbage, per person, per day on medium-sized ships. Similarly, offshore oil and gas platforms and offshore supply vessels can generate debris both from daily operations and from the crew. In the absence of appropriate treatment facilities on board and reception facilities on land, waste may be dumped intentionally. Cargo washed overboard can also constitute marine debris (ibid., para. 239).

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[20] For a detailed treatment of the subject, see A/60/63, paras. 232-283; the report on the work of the Consultative Process at its sixth meeting (A/60/99, part A, paras. 14-17, part B, paras. 85-100); and the UNEP/GPA publication, "Marine litter: an analytical overview", and leaflet, "Tightening the noose" (2005).

[21] Marine debris has repercussions on coastal economic activities, particularly tourism.

43. Commercial fishing activities introduce marine debris into the oceans through accidental loss of fishing gear or through intentional disposal of worn-out gear. It is estimated that 30 per cent of all marine debris originates from the fishing industry. Owing to the resistance of modern synthetics to degradation, it is believed that some derelict fishing gear continues to circulate in the oceans through currents for years or decades, until it washes up on shallow reefs, banks or beaches, eventually degrading. This type of marine debris has been identified as the most threatening to biological resources (ibid. para. 240).

44. There are no recent and reliable figures on the amount of marine debris worldwide. Nevertheless, some calculations estimate that 8 million items of marine debris enter the oceans and seas every day.

45. A review of the effects of marine debris on marine wildlife indicates that at least 267 species are affected by debris. Entanglement and ingestion are the primary kinds of direct damage to wildlife caused by marine debris. Species affected by entanglement and ingestion include sea turtles, seabirds and marine mammals (ibid., para. 245). Other threats to wildlife and the environment from marine debris include physical damage, such as covering of coral reefs, smothering of seagrass beds and other seabed ecosystems, and disturbance of habitats. Marine debris, including debris originating from fishing activities, may also put additional pressure on commercial fish stocks (see A/59/298, para. 81) as an important cause of by-catch, for example.

46. Marine debris is also increasingly believed to be a source of accumulation of toxic substances in the marine environment and environmental changes owing to the transfer and introduction of invasive species. In fact, marine debris drifting on ocean currents may eventually become home to entire communities of potentially harmful, non-native organisms which can be carried throughout the oceans.

47. Since the majority of marine debris results from human behaviour, efforts should be made to address waste management on land and on board ships, and to prevent the discharge of marine debris at sea. Also, as recommended by the General Assembly (resolution 61/222, para. 80), relevant organizations and bodies should be encouraged to assist in the process of assessing the effectiveness of annex V to the Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), in addressing sea-based sources of marine debris.

48. *Pollution from mining*. The discovery on the deep ocean floor of potentially valuable polymetallic nodules (or manganese nodules), polymetallic sulphides and other mineral resources has generated interest in deep sea mining, but also in its potential environmental impacts (see also A/60/63/Add.1, paras. 167-173). Because the biological resources of the deep seabed are symbiotically linked to the mineral resources, and in some cases feed upon them, the conservation and management of deep seabed biodiversity is related to the regulation of deep seabed mining (see A/59/62, para. 264).

49. In this respect, concerns have been raised that the biological resources of seamounts are potentially threatened by mining for ferromanganese crusts, hydrothermal vents may be damaged by mining for polymetallic sulphides, bacteria in gas hydrates may be harmed by extractive activities and any organisms found on

the ocean floor or on polymetallic nodules may be damaged by mining for those nodules.

50. In these cases, the regulation of mining activities and the protection of the marine environment from mining activities fall within the mandate of the International Seabed Authority (ibid., para. 266; see also A/62/66, para. 148). The Authority has adopted Regulations on the Prospecting and Exploration of Polymetallic Nodules in the Area, and is currently developing regulations on prospecting and exploration of polymetallic sulphides and for cobalt-rich ferromanganese crusts, respectively (see A/62/66/Add.1, paras. 59 and 61). In particular, the Authority has established regulations applicable to the contractors, the monitoring of potentially harmful activities and the setting of environmental baselines. During 2008-2010, the Authority will focus its substantive work on the promotion of a better understanding of the potential environmental impacts of deep seabed mining, including exploration and exploitation (ibid., para. 57; see also paras. 110, 156-157, 184, 197 and 253 below).

C. Ocean noise

51. There is growing concern that noise proliferation poses a significant threat to the survival of marine mammals, fish and other marine species (see A/60/63, para. 157). Sources of anthropogenic ocean noise include the use of explosives, marine scientific research, underwater construction, ship traffic, military sonars and air guns used for seismic surveys for oil and related activities (see A/60/63/Add.1, para. 159).

52. Underwater noise propagates over significant distances (from metres to hundreds of kilometres) depending on many factors, including its frequency. It has been suggested that powerful sources of ocean noise, such as some military sonars and shipping, can propagate over hundreds of kilometres in the form of energy which can have adverse effects on marine life ranging from disturbance to injury and mortality.[22] Marine animals use sound to navigate, find food, locate mates, avoid predators and communicate with each other. Flooding their world with intense sound interferes with these activities with potential serious consequences.

53. Another source of noise pollution is seismic testing. This process, which provides information on rock formations and the likely location of oil, requires shooting high-pressure sound waves into the ocean towards the seabed, which then bounce back at varying speeds and intensities. It has been stated that a large seismic array can produce peak pressures of sound that are higher than those of virtually any other anthropogenic source, except explosives (over 250 decibels) and that the extreme pressure of these sound waves harms marine life. For example, if the seafloor is hard and rocky, the noise might be heard for thousands of miles. Under specific conditions, it can reverberate in such a way so as to sound nearly continuous, masking the calls of whales and other animals which rely on the acoustic environment for breeding and survival.[23] Additional negative effects on

[22] International Fund for Animal Welfare and Natural Resources Defense Council, "Underwater noise: a harmful unregulated pollution", report submitted to the Stakeholder meeting on the European Marine Strategy, Rotterdam, 2004.

[23] M. Jasney and C. Horowitz, "The costs of seismic exploration", Natural Resources Defense Council (2 March 2005) (available from http://www.terranature.org/oceanNoise.htm).

marine life include destruction of eggs and larvae, and damage to fish with swim bladders, such as rockfish. Studies have also found that seismic testing disrupts traditional migratory paths of marine mammals and fish, causing some species to leave an area entirely. In some cases, fish catches have been reduced by at least 50 per cent.[24]

54. Ocean noise and the potential threat it poses to the marine environment is addressed in a number of international forums which continue to call for research, monitoring and efforts to minimize the risk of adverse effects of ocean noise on marine living resources (see A/62/66/Add.1, chap. X, sect. F; see also para. 254 below).

D. Impacts of marine scientific research

55. Marine scientific research is essential in order to understand marine ecosystems, discover biological resources and assess the potential effects of ocean activities on these ecosystems and resources. If not conducted with due care, however, scientific research itself could have an adverse impact on marine biodiversity and ecosystems. Research vessels and equipment could cause disturbances in the water column and on the seabed, especially with frequent visits and repeated sampling of the same areas. Research activities on the seabed could alter environmental conditions and cause perturbations harmful to organisms similar to those of seabed mining. The introduction of light, noise and heat in areas where these are absent could cause stress to organisms in the area. Smothering, physical disturbance from sediment removal or spreading, the deposit of debris and chemical or biological contamination also have an impact on biodiversity. Finally, the removal of an entire hydrothermal vent could cause the extinction of associated fauna. The frequency of research expeditions is a cause for concern, especially with plans for systematic observations under various monitoring programmes (see A/60/63/Add.1, paras. 174-175). To date, however, there has not been any comprehensive assessment of the impacts of marine scientific research on marine biodiversity.

56. To address these concerns, a group of scientists, under the auspices of InterRidge, has developed a voluntary code of conduct for hydrothermal vent research (see A/62/169). InterRidge, has reported that the code provides an essential foundation to any overall ethical strategy and provides a documented minimum benchmark of expected behaviour among InterRidge collaborating organizations. The code helps to communicate InterRidge's expected ethical standards and, if necessary, provides a reference against which penalties or sanctions could be imposed on violators (ibid., paras. 67-70; see also paras. 111 and 274 below). With a few exceptions, information about compliance with voluntary codes is not readily available, making it difficult to assess their success in reaching their stated objectives (see A/62/169, para. 68). For information on other recent initiatives to increase scientific knowledge, see paragraphs 92 to 94, 110, 111 and 197 to 199 below.

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[24] A study found that seismic testing affects fish distributions for 18 to 20 nautical miles (33 to 37 km) on either side of the shooting area and can result in decrease in trawl catches by 70 per cent in the shooting area and by 50 per cent over the entire study area. (See http://www.livingoceans.org/oilgas/impacts.shtml.)

E. Anthropogenically driven climate change

57. The Intergovernmental Panel on Climate Change has concluded, with at least 90 per cent certainty, that most of the observed increase in globally averaged temperatures since the mid-twentieth century is due to an observed increase in anthropogenic greenhouse gas concentrations (see A/62/66, para. 330).

58. As regards future impacts for the range of climate changes projected over the next century, the Panel made the following key findings: the resilience of many ecosystems was likely to be exceeded by an unprecedented combination of climate change, associated disturbances (e.g., flooding, ocean acidification), and other global change drivers (e.g., land use change, pollution, overexploitation of resources); approximately 20 to 30 per cent of assessed plant and animal species was likely to be at increased risk of extinction if increases in global average temperature exceeded 1.5-2.5°C; if such temperatures were exceeded, major changes were projected in ecosystem structure and function, species' ecological interactions, and species' geographic ranges, with predominantly negative consequences for biodiversity, and ecosystem goods and services (e.g., water and food supply); the progressive acidification of oceans owing to increasing atmospheric carbon dioxide (CO^2) was expected to have negative impacts on shell-forming organisms (e.g., corals) and their dependent species; and regional changes in the distribution and production of particular fish species were expected owing to continued warming, with adverse effects projected for aquaculture and fisheries (A/62/66/Add.1, para. 229).

59. Global atmospheric concentrations of CO^2, methane and nitrogen oxide have increased markedly as a result of human activities.[25] Increasing industrial practices have led to an accumulation of CO^2 and other greenhouse gases, which threaten to cause climatic changes, including a global warming of the atmosphere and considerable sea level rise.[26] There has been widespread melting of snow and ice, in particular in the polar regions, and rising global average sea level (see A/62/66, para. 329).

60. Oceans absorb huge quantities of CO^2 and influence climate and weather patterns. Planktonic marine microalgae contribute between 80 to 90 per cent to the ocean's productivity both in terms of carbon assimilation and oxygen generation. However, the increased dissolution of CO^2 in the ocean has led to a measurable increase in its acidity, estimated to lower pH to 7.95 by the year 2100. Because of the complex interactions between coral reef biology and this global-scale stress, it is not certain how individual species or whole reefs will be impacted. Recent experimental studies show a decrease in the ability of some coral species to produce calcium carbonate under lower dissolved carbonate conditions and higher ocean acidity. Other coral species may be adaptable to changing ocean chemistry and capable of calcifying at healthy rates.

61. Various methods are being explored to mitigate the effects of climate change. CO^2 sequestration into sub-seabed/terrestrial geological formations is one measure that has been developed to address elevated levels of CO^2 in the atmosphere and

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[25] Contribution of Working Group I to the Fourth Assessment report of the Intergovernmental Panel on Climate Change, 5 February 2007.

[26] For more details on sea level rise, see also Intergovernmental Panel on Climate Change Working Group I report.

contributing to climate change and ocean acidification.[27] CO^2 sequestration consists of the capture and permanent storage in oceanic geological formations of carbon dioxide that would otherwise be emitted to the atmosphere. CO^2 is separated from flue gases, pressurized and transported by pipeline or vessel to the selected geological storage site with the potential risk of leakage of CO^2 during transportation or storage, which can happen either abruptly or gradually. This may potentially cause lower pH and acidification of the oceans. Scientific information currently available suggests that such changes in the ocean chemistry could have a profound effect on corals, shellfish, specific groups of phytoplankton, and other calcareous organisms thereby affecting biodiversity and disrupting the marine food web and ocean biogeochemistry, including beyond areas of national jurisdiction (see http://www.imo.org).

62. Another proposed method to lower concentrations of CO^2 in the atmosphere is using geo-engineering options, such as ocean fertilization to remove CO^2 directly from the atmosphere using iron. Iron added to the ocean surface increases the plankton production. Plankton take up carbon in surface waters during photosynthesis, creating a bloom that other animals feed upon. Carbon from the plankton is integrated into the waste products from these animals and other particles, and settles to the seafloor as "marine snow" in a process called the "biological pump". In theory, fertilizing the ocean with iron would therefore result in more carbon being removed from surface waters to the deep ocean. Once in the deep ocean, the carbon would be "sequestered" or isolated in deep waters for centuries. The oceans already remove about one third of the CO^2 released each year owing to human activities, so enhancing this ocean sink could in theory help control atmospheric CO^2 levels and thus regulate climate.[28]

63. The Scientific Group to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 and the 1996 Protocol thereto has released a statement of concern (LG/SG30/14 and annex 3) regarding the large-scale nutrient fertilization of oceans using iron to sequester CO^2 noting that, although iron fertilization of oceans might assist in removing CO^2 from the atmosphere by stimulating phytoplankton growth, the environmental and health effects of such an activity needed to be evaluated further. According to the Scientific Group, knowledge about the effectiveness and potential environmental impacts of iron fertilization is currently insufficient to justify large-scale operations. Working Group III of the Intergovernmental Panel on Climate Change also stated that these options remained largely speculative and unproven, with the risk of unknown side effects, and that reliable cost estimates had not been published (see A/62/66/Add.1, para. 235).

64. Increased international cooperation is required in order to effectively address anthropogenic activities with an impact on climate change (ibid., chap. XI).

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[27] For additional information, see A/62/66, paras. 290-291 and A/62/66/Add.1, para. 196.

[28] S. Dawicki, "Effects of ocean fertilization with iron to remove carbon dioxide from the atmosphere reported", news release, 16 April 2004, available from http://www.whoi.edu.

III. Coordination and cooperation among States as well as relevant intergovernmental organizations and bodies for the conservation and management of marine biological diversity beyond areas of national jurisdiction

65. The duty to cooperate is an essential element of the regime established by UNCLOS, in particular for areas beyond national jurisdiction. Under the Convention, States are required to cooperate in the conservation and management of the living resources in the high seas, and in the establishment of international measures for the protection and preservation of the marine environment. States are also required to promote international cooperation in marine scientific research, and in relation to the development and the transfer of marine technology. In addition, the regime for the Area, which was devised for the benefit of mankind also promotes international cooperation (part XI and the 1994 Agreement relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982 (the "Part XI Agreement")). Competent international organizations are also required to cooperate either directly or in close cooperation among themselves in relation to the implementation of parts XIII and XIV of UNCLOS (see, for example, arts. 118, 197, 242, 268, 269-274 and 278).

66. The conservation and sustainable use of marine biodiversity, including beyond areas of national jurisdiction, is a cross-cutting issue regulated and managed by numerous, and often overlapping, legal frameworks, organizations and bodies, at the national, regional and global levels. Cooperation among these bodies, at all levels, as well as across sectors and regimes with varying competencies beyond areas of national jurisdiction, facilitates a coordinated approach to activities aimed at the conservation and sustainable use of such biodiversity, including by avoiding duplication of work and mandates.

67. In recent years, a number of management approaches have been developed which also require international cooperation and coordination at the national and international levels for their effective implementation. For example, an ecosystem approach to ocean management requires coordination among and across sectors in order to establish integrated decision-making processes and management of multiple activities and sectors, including in relation to areas beyond national jurisdiction.

68. International cooperation occurs in various ways, including through the negotiation and implementation of international instruments and measures and participation in the work of international organizations. Section A below analyses these forms of cooperation. Section B provides information on current activities of cooperation and coordination among international organizations and bodies. Examples of cooperation and coordination among States and international organizations and bodies are presented in section C below, while section D addresses areas where cooperation and coordination could be strengthened.

A. Cooperation and coordination among States

69. The primary responsibility to cooperate and facilitate a coordinated approach to the conservation and sustainable use of marine biodiversity beyond areas of

national jurisdiction is a responsibility of States. To that end, coordination at the national level and the integration of sectoral policies are indispensable.

1. International instruments and measures

70. The negotiation of international instruments, both binding and non-binding, addressing various aspects of the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction, is evidence of a political commitment by States to achieve commonly acceptable ways and means to address a problem of global or regional concern. This is usually an ongoing process as the effectiveness of the instruments and measures are continually reviewed. In many cases, negotiations at the regional level provide an effective way to address specific problems in a regional context.

71. Relevant recent examples of such negotiations are the ongoing process of negotiation of two new RFMOs for the South Pacific Ocean and for the North-Western Pacific Ocean.

72. The negotiations in respect of the South Pacific Ocean, which are concerned with high seas fisheries for non-highly migratory species in the region, have led to the adoption of an agreement to apply "interim measures" for the management of bottom fisheries on the high seas in the South Pacific until the RFMO negotiations are concluded and the organization is formally established.[29]

73. The negotiations concerning the management of high seas bottom fisheries in the North-Western Pacific Ocean have led to the adoption of a document entitled "Establishment of new mechanisms for protection of vulnerable marine ecosystems and sustainable management of high seas bottom fisheries in the North-Western Pacific Ocean", which includes provisions for interim measures and elements of a long-term mechanism for international management of high seas bottom fisheries in the region and other matters (available from http://www.fpir.noaa.gov). The interim secretariat of the Intergovernmental Meeting has been requested to prepare the draft text of a long-term agreement.

74. The interim measures agreed as a result of both negotiations are based on the blueprint for international action established in General Assembly resolution 61/105, paragraphs 80 to 91, to protect vulnerable marine ecosystems from the impacts of bottom fishing. A number of General Assembly resolutions, both on oceans and the law of the sea and on sustainable fisheries, have addressed specific issues related to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction.[30] The negotiations leading to the adoption of those resolutions are another example of cooperation.

75. Cooperative agreements among a limited number of States for the conservation and sustainable use of marine biodiversity at the regional level have provided a basis for the adoption of measures with a broader scope. For example, the Pelagos Sanctuary for Marine Mammals in the Mediterranean (see paras. 133 and 151 below), initially established by a tripartite agreement among France, Italy and

[29] The third international meeting on the establishment of the proposed South Pacific RFMO took place in Reñaca, Chile, from 30 April to 4 May 2007. The report of the meeting is available from http://www.southpacificrfmo.org.

[30] See, for example, the following resolutions on oceans and the law of the sea: 59/24; 60/30; and 61/222. Resolutions on sustainable fisheries include: 59/25; 60/31; and 61/105.

Monaco in 1999, was later designated as a Specially Protected Area of Mediterranean Interest (SPAMI) under the 1995 Protocol Concerning Mediterranean Specially Protected Areas and Biological Diversity in the Mediterranean to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean ("Barcelona Convention").

76. The need to improve cooperation and coordination for the implementation of existing instruments[31] to enhance an integrated approach to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction, including by combining the sectoral approaches adopted under current instruments, has also been highlighted (see A/61/65, paras. 50-62; see also paras. 264-267 below). Coordination among the provisions of different instruments has taken place, in some instances, by the incorporation of the provisions of specific instruments into other instruments. For example, annex IV to the 1991 Madrid Protocol incorporates the stricter requirements of Special Area designation under MARPOL 73/78 with respect to pollution from oil, noxious liquid substances, and garbage. In addition, it provides for ongoing consistency with MARPOL 73/78 as the latter is amended or new regulations are adopted. With regard to by-catch, the parties to the Convention on Migratory Species Agreement on the Conservation of Albatrosses and Petrels must adopt, in relation to fishing activities within the area of an RFMO, measures at least as stringent as those agreed by the RFMO for reducing the incidental take of albatrosses and petrels (see UNEP/CBD/W6-PA/I/INF/2).

77. The enforcement of instruments beyond areas of national jurisdiction, in particular those relating to fishing activities in the high seas, raises specific cooperation issues. In those areas, flag States have the primary responsibility to exercise jurisdiction and control over ships flying their flags. Effective flag State control over vessels flying their flag is therefore essential to ensure implementation and enforcement of international instruments.

78. In the case of fishing activities, and in light of the impacts of IUU fishing, international cooperation in enforcement is an important element for the conservation and management of marine living resources. To that end, the 1995 Fish Stocks Agreement recognizes that effective enforcement on the high seas must rely on better cooperation among States, by protecting at the same time the interests of flag States. The 1993 FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas (the "FAO Compliance Agreement") was also adopted to improve monitoring, control and enforcement by flag States on the high seas. Both under the 1995 Fish Stocks Agreement and the FAO Compliance Agreement, port States also have a role in international cooperation in relation to enforcement (see also paras. 177, 178, 180, 304 and 306 below).

79. The implementation, compliance with and enforcement of international instruments are also an essential part of international cooperation. To that end,

[31] The legal framework and relevant intruments for the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction are presented in A/59/62/Add.1, paras. 237-287 and A/60/63/Add.1, paras 184-196.

cooperation towards capacity-building for developing countries is of special importance.[32]

2. Participation in the work of international organizations

80. Global and regional organizations provide the forums for multilateral cooperation among States. Through their participation in the work of such organizations, States cooperate to identify common solutions to problems of common concern. The implementation of the commitments agreed upon in the context of international organizations is the end result of this form of cooperation.

81. Numerous global multilateral forums, including the General Assembly and the processes it has established, such as the Consultative Process and the Working Group, as well as UNEP, the Convention on Biological Diversity and other biodiversity-related forums, FAO, IMO, IOC, the International Seabed Authority, the International Whaling Commission, and other organizations, have addressed various aspects related to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction.

82. At the regional level, cooperation for the protection and preservation of the marine environment is fostered by the UNEP Regional Seas Programme, consisting of 13 regional seas conventions and action plans and five independent partner organizations covering more than 140 coastal States and small island developing States, and a number of regional organizations, such as the Commission of the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) and the Antarctic Treaty Consultative Meeting. Some of these regional organizations have a mandate that extends beyond areas of national jurisdiction and have considered specific aspects related to the conservation and sustainable use of marine biodiversity in those areas. As regards the impacts of fishing activities on biodiversity beyond areas of national jurisdiction, RFMOs facilitate cooperation, including through the adoption of ecosystem-based measures for the conservation and management of fisheries resources (see paras. 145-147 and 289-307 below). A number of regional agreements addressing particular species, for example, the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas and the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area, also provide forums for regional cooperation.

83. Recent reports of the Secretary-General provide a summary of policy developments in the context of the above organizations and bodies (see also A/60/63/Add.1 and 2; A/61/63 and Add.1; and A/62/66 and Add.1). Also, in the context of the twenty-fourth session of the IOC Assembly, held from 19 to 28 June 2007, the IOC member States, in responding to the Johannesburg Plan of Implementation of the World Summit on Sustainable Development[33] and the Millennium Development Goals, adopted the Medium-Term Strategy for 2008-2013, which addresses, inter alia, safeguarding the health of oceans ecosystems.[34]

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[32] See, for example, paras. 112-115, 282, 284 and 288 below; and also technical assistance by the World Bank and GEF (paras. 102 and 114).

[33] *Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002* (United Nations publication, Sales No. E.03.II.A.1 and corrigendum), chap. I, resolution 2, annex.

[34] IOC/UNESCO contribution to the present report.

84. The move towards integrated and ecosystem approaches to ocean management is to be achieved, inter alia, through better institutional cooperation and coordination. This is particularly relevant in the context of the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction, bearing in mind the role and mandate of relevant organizations and sectors. This prompts the need for States to harmonize the mandate of those organizations in order to ensure a coordinated approach to their activities, including by integrating their respective areas of expertise (see also paras. 86-104).[35] For example, the FAO has recently undertaken a review, in preparation for the eleventh session of the Commission on Genetic Resources for Food and Agriculture held from 11 to 15 June 2007, of the status and needs of aquatic genetic resources for food and agriculture of specific relevance to fisheries and aquaculture, as a basis for the establishment of a long-term intergovernmental agenda to deal with the subject.[36] As a result, the Commission requested that coverage of aquatic genetic resources under the Multi-year Programme of Work should be undertaken in collaboration with, inter alia, the FAO Committee on Fisheries (COFI), the Convention on Biological Diversity, UNCLOS, the Consultative Process, regional and international fisheries organizations and networks, and industry. It noted that FAO was well placed to coordinate the work relating to the sustainable use and conservation of aquatic genetic resources (see C6 RFA-11/07/Report, paras. 57-64).

85. Supporting and enabling scientific work to inform sound decision-making and implementation is imperative, particularly to address scientific gaps beyond areas of national jurisdiction where information on high seas fisheries, vulnerable habitats and ecosystems interactions is often lacking. Some States, either through direct cooperation or through international organizations, have promoted the international scientific agenda in this regard, as noted in paras. 129 and 166-167 below.[37]

B. Cooperation and coordination among intergovernmental organizations and bodies

86. Ecosystem approaches provide a valuable framework for inter-institutional cooperation and coordination in order to address cross-cutting issues relating to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction in an integrated manner. Cooperation and coordination among international organizations can take the form of joint or coordinated programmes of work and activities between two or more organizations, or of a global coordination mechanism. It also contributes to avoiding duplication of work and ensuring that each organization contributes to the achievement of shared goals within its area of competence and expertise.

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[35] For example, in decision VIII/24, the eighth meeting of the Conference of the Parties to the Convention on Biological Diversity decided that the Convention should support the work of the General Assembly, as the body with a central role in addressing issues relating to the conservation and sustainable use of biodiversity in marine areas beyond national jurisdiction, by focusing on provision of scientific and, as appropriate, technical information and advice relating to marine biological diversity, the application of the ecosystem approach and the precautionary approach, and in delivering the 2010 target to significantly reduce the current rate of biodiversity loss.

[36] Contribution of FAO to the present report.

[37] Contribution of Canada to the present report.

87. *UN-Oceans*. In response to the commitment made in paragraph 30 (c) of the Johannesburg Plan of Implementation to "establish an effective, transparent and regular inter-agency coordination mechanism on ocean and coastal issues within the United Nations system",[33] the United Nations High-level Committee on Programmes established UN-Oceans in 2003. This call was subsequently reiterated by the General Assembly, which further recommended that the new mechanism be based on the principles of continuity, regularity and accountability (see resolution 58/240). UN-Oceans comprises a core membership of 12 organizations, funds, programmes and bodies of the United Nations system with competence in ocean issues. This work programme is mainly carried out by a number of ad hoc, time-bound task forces set up under the guidelines suggested by the High-level Committee. The Task Force on Biodiversity in Marine Areas Beyond National Jurisdiction, with the Division for Ocean Affairs and the Law of the Sea and the secretariat of the Convention on Biological Diversity as lead agencies, coordinates the input of information to the General Assembly, the Convention on Biological Diversity, and other international processes dealing with biodiversity beyond areas of national jurisdiction. Most recently, the Task Force provided information on its members' activities relating to genetic resources to the eighth meeting of the Consultative Process (see A/62/169, paras. 109-113; see also para. 116 below).

88. At its fifth meeting, held in May 2007, UN-Oceans agreed to establish a time-bound, task-oriented Task Force on Marine Protected Areas and Other Area-based Management Tools, under the co-leadership of the secretariat of the Convention on Biological Diversity, UNESCO/IOC, FAO and UNEP. Other members who expressed an interest to participate include the Division for Ocean Affairs and the Law of the Sea, IMO, the United Nations Development Programme (UNDP), the World Bank and the International Seabed Authority. The Task Force will, inter alia, seek to strengthen collaboration and coordination among United Nations organizations dealing with MPAs, in particular in addressing the Convention on Biological Diversity and the goals and targets of the World Summit on Sustainable Development.

89. In addition to its task forces, UN-Oceans has developed the United Nations Atlas of the Oceans (www.oceansatlas.org), for which UN-Oceans provides oversight and direction. This Atlas is a web-based information system bringing together data on ocean and marine sustainable development and management issues, maps and development trends produced by the United Nations system and selected partners.

90. *GESAMP*. The Joint Group of Experts on the Scientific Aspects of Marine Environmental Protection, established in 1969 as a mechanism for coordination and collaboration, advises the United Nations system on the scientific aspects of marine environmental protection. At present, it is jointly sponsored by eight United Nations organizations with responsibilities relating to the marine environment. Its functions are to conduct and support marine environmental assessments, to undertake in-depth studies, analyses, and reviews of specific topics, and to identify emerging issues regarding the state of the marine environment. GESAMP consists of 25 to 30 experts, drawn from a wide range of relevant disciplines, including biodiversity-related disciplines, who act in an independent individual capacity. Studies and assessments are usually carried out by dedicated working groups.

91. The GESAMP work programme includes providing, upon request: integrated and synthesized results of regional and thematic assessments and scientific studies to support global assessments of the marine environment; scientific and technical guidance on the design and execution of marine environmental assessments; scientific reviews, analyses, and advice on specific topics relevant to the condition of the marine environment, its investigation, protection, and/or management. In addition, GESAMP regularly provides an overview of the marine environmental monitoring, assessment, and related activities of United Nations agencies and advises on how these activities might be improved, better integrated and coordinated. It also identifies new and emerging issues regarding the degradation of the marine environment that are of relevance to Governments and sponsoring organizations.

92. *Ad hoc cooperation among relevant organizations*. There are a number of recent examples of this form of cooperation. IOC/UNESCO and UNEP have cooperated in the preparation of the report *Seamounts, Deep-sea Corals and Fisheries*.[38] In addition, IOC/UNESCO, in cooperation with Diversitas, an international programme on biodiversity science, held an expert session to develop a programme on systematic observations of long-term changes in marine coastal biodiversity, including microbial diversity, in a number of sites around the world.[39]

93. UNESCO and the UNU-Institute of Advanced Studies have conducted an assessment of available scientific knowledge on marine genetic resources, as well as of scientists' perspectives on the issue (see para. 218 below).[40]

94. In 2006, UNEP became a partner in the multidisciplinary European Union deep sea research project, the Hotspot Ecosystem Research on the Margins of European Seas. This engagement provides UNEP with direct access to new research findings on deep water marine biodiversity and ecosystems both within and beyond areas of national jurisdiction, and enables UNEP to raise awareness on relevant issues at the global level by, inter alia, disseminating information.[41]

95. In response to decision VIII/24 of the Conference of the Parties to the Convention on Biological Diversity, the secretariat of the Convention and the UNEP-World Conservation Monitoring Centre have collaborated in: the preparation of an Internet accessible, interactive map of high seas MPAs and key habitats distributions (including deep-sea corals and seamounts) and ecological regions adopted by various international, intergovernmental conventions, organizations and bodies, including RFMOs, to manage and preserve high seas biodiversity and resources under their jurisdiction; the preparation of a report providing an overview of key high seas habitats, species, ecoregional approaches and high seas MPAs; and consultations with centres of expertise, including IOC/UNESCO, FAO, the UNEP Coral Reef Unit and the Global Ocean Observing System. The secretariat of the Convention on Biological Diversity is also preparing, in collaboration with the Division for Ocean Affairs and the Law of the Sea, an information document, for submission to the thirteenth meeting of the Convention on Biological Diversity Subsidiary Body on Scientific, Technical and Technological Advice, on options for preventing and mitigating the impacts of some activities on selected seabed habitats,

[38] *Regional Seas Report and Studies*, No. 183 (2006).

[39] Contributions of IOC/UNESCO and UNEP to the present report.

[40] Contribution of UNU to the present report.

[41] Contribution of UNEP to the present report.

in response to a request contained in decision VIII/21, paragraph 7, of the Conference of the Parties to the CBD.[42]

96. As regards cooperation and coordination among biodiversity-related conventions,[43] the governing bodies of these conventions have each recognized the need for enhanced cooperation among their respective instruments. The Strategic Plan for the Convention on Biological Diversity requests the Convention to promote cooperation between all relevant international instruments and processes to enhance policy coherence, and encourages other international processes to actively support implementation of the Convention, in a manner consistent with their respective framework (see UNEP/CBD/COP/6/20, decision VI/26). The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) Strategic Vision 2008-2013[44] recognizes that mutual supportiveness and effective implementation of multilateral environmental agreements and enhanced cooperation among biodiversity-related conventions and processes is an important condition for effective measures to halt the loss of global biodiversity. The Strategic Plan for the Convention on Migratory Species 2006-2011 calls for cooperative activities in pursuit of shared targets with relevant MEAs and other partners, including the Regional Seas Programme (see UNEP/CMS resolution 8.2, annex). The Operational Guidelines for the Implementation of the World Heritage Convention (document WHC.05/2) also include provisions for the strengthening of synergies with other agreements, including the other biodiversity-related conventions.

97. The Rio Conventions (the Convention on Biological Diversity, the United Nations Framework Convention on Climate Change and the United Nations Convention to Combat Desertification) established a Joint Liaison Group in 2001 to exchange information, explore opportunities for synergistic activities and increase coordination. The Convention on Biological Diversity, the Convention on Migratory Species, CITES, the International Treaty on Plant Genetic Resources for Food and Agriculture, the Ramsar Convention on Wetlands and the World Heritage Convention have established a Biodiversity Liaison Group. The Convention on Biological Diversity is also cooperating with regional seas conventions and action plans, in particular the Mediterranean Action Plan of the Barcelona Convention, and is examining options for a flexible framework between all relevant actors, such as the global partnership on biodiversity, in order to enhance implementation through improved cooperation (Conference of Parties decision VII/26, para. 3). A memorandum of cooperation was signed between FAO and the secretariat of the Convention on Biological Diversity in 1997, which calls for, inter alia, cooperation "in the dissemination of information and the building of relevant capacity for the effective implementation of the Convention".

98. As regards cooperation between CITES and FAO, the two organizations have formalized their working relationship in a memorandum of understanding signed in 2006. Under the memorandum of understanding, FAO and CITES review and consult together on the scientific, legal and technical evaluation of commercially exploited aquatic species listed or proposed for listing in the CITES Appendices.

[42] Contribution of the Convention on Biological Diversity secretariat to the present report.

[43] Although not specifically addressing activities relating to marine areas beyond national jurisdiction, these types of cooperation provide useful examples for cooperative activities in respect of those areas.

[44] Adopted at the fourteenth meeting of the Conference of Parties of CITES; available from http://www.cites.org.

99. The important role of CITES in supporting the management decisions of the International Whaling Commission and the importance of continued cooperation between the two organizations was also recently reaffirmed by the Commission, which considered that any weakening of existing restrictions on trade under CITES could have significant adverse effects on the moratorium on commercial whaling and increase threats to whales (International Whaling Commission resolution 2007-4). Conversely, at its fourteenth meeting, the Conference of the Parties to CITES also agreed that no periodic review of great whale listings on CITES Appendices should be undertaken while the International Whaling Commission moratorium is in place (see A/62/66/Add.1, para. 154).

100. In 2000, the heads of the Convention on Migratory Species and International Whaling Commission secretariats signed a memorandum of understanding outlining various measures intended to promote and strengthen cooperation and institutional linkages between the two organizations in their respective areas of competence. Among others, the memorandum of understanding seeks to ensure mutual participation in meetings of the respective convention bodies and to enhance information exchange and coordination of programmes, wherever possible. ,

101. The Convention on Migratory Species secretariat and Scientific Council have developed a programme of work to implement Convention on Migratory Species resolution 8.22 (2005) on human-induced impacts on cetaceans. A review is being undertaken, in collaboration with the scientific advisory bodies of the Convention on Migratory Species cetacean-related agreements, of the extent to which the Convention, cetacean-related agreements and other relevant bodies such as the IMO, the International Whaling Commission, OSPAR, the Consultative Process, FAO, COFI and RFMOs, as well as the UNEP Regional Seas Programme are addressing a set of human-induced impacts, which include entanglement and by-catch, climate change, ship strikes, pollution, habitat and feeding ground degradation and ocean noise. The report aims at identifying points of collaboration and synergies while analysing gaps and overlaps.[45]

102. The World Bank, the major international funding source for biodiversity projects, often in collaboration with the Global Environment Facility (GEF), is able to mobilize funding, expertise and partnerships for biodiversity conservation. While less than half of the funds are for marine biodiversity conservation, and almost all projects apply to the exclusive economic zone (EEZ) of coastal States, the Bank engages in a variety of relevant global forums as an observer (e.g., the Convention on Biological Diversity) or partner (e.g., the IUCN World Commission on Protected Areas; the International Coral Reef Initiative (ICRI); UN-Oceans). The Bank assists countries in the implementation of international instruments, such as the regional seas conventions and action plans and the FAO Code of Conduct for Responsible Fisheries (the "FAO Code of Conduct"). Under the Global Programme on Sustainable Fisheries the Bank is promoting dialogue at the international level on addressing major gaps in fisheries governance both within and beyond areas of national jurisdiction. Under this programme, a forum on fisheries is convened in collaboration with FAO to raise the profile and try to reach agreement on key governance issues, including IUU fishing and the elimination of perverse subsidies.

[45] Contribution of the Convention on Migratory Species secretariat to the present report.

Through the programme, the Bank also strives to coordinate the activities of major donors in the fisheries sector.[46]

103. In the context of RFMOs, a recent example of cooperation among relevant organizations was the Joint Meeting of Tuna RFMOs held from 22 to 26 January 2007, in Kobe, Japan, to address issues of common interest. While noting that tuna RFMOs have their own specificities, it was agreed that cooperation among them could increase their effectiveness and efficiency in managing all tuna stocks, including in the implementation of the precautionary approach and an ecosystem approach to fisheries (see A/62/66/Add.1, paras. 129 and 130). As regards RFMO coordination generally, the FAO organizes a meeting of RFMOs on a biannual basis.

104. Also at the regional level and in the context of prevention, preparedness and response to marine pollution from ship-related activities, the UNEP Regional Seas programme, through the regional secretariats and the dedicated oil spill preparedness and response regional activity centres, can act as an effective platform for improved and coordinated regional implementation of international agreements, programmes and initiatives (see A/59/63, paras. 142-144 and 162-163).

C. Cooperation and coordination among States and intergovernmental organizations

105. A number of processes of relevance to marine biodiversity beyond areas of national jurisdiction provide a mechanism for cooperation and coordination among States and intergovernmental organizations, some of which are outlined below.

1. Regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects

106. In paragraph 36 (b) of the Johannesburg Plan of Implementation,[33] States agreed to establish a regular process, under the United Nations, for global reporting and assessment of the state of the marine environment, including socio-economic aspects, both current and foreseeable, building on existing regional assessments. The General Assembly endorsed this proposal in resolution 57/141. At its fifty-ninth session, the Assembly also reaffirmed the importance of establishing the regular process as a significant mechanism for increased research and collection of information for the protection of the marine environment and biodiversity. In resolution 60/30, the Assembly decided to launch the preparatory stage towards the establishment of the regular process, the "assessment of assessments", and established the Ad Hoc Steering Group to oversee that assessment phase. The Assembly also invited UNEP and IOC/UNESCO to jointly lead the preparatory stage, and provided for the establishment of a group of experts to undertake the assessment of assessments. The Ad Hoc Steering Group is composed of five representatives of Member States from each of the United Nations regional groups, as well as representatives from FAO, the World Meteorological Organization (WMO), IMO, IOC and UNEP, as well as the International Seabed Authority. The Division for Ocean Affairs and the Law of the Sea and the Department of Economic and Social Affairs of the United Nations participate as observers.

[46] Contribution of the World Bank to the present report.

107. The membership of the Group of Experts was approved by the Ad Hoc Steering Group. Some international organizations and other bodies have observer status in the Group of Experts (e.g., UNESCO, the UNEP World Conservation Monitoring Centre and GESAMP). In accordance with their workplan (see A/62/66/Add.1, para. 249), the experts are to conduct evaluations of existing assessments for the purpose of identifying best practices and will be working in cooperation with national and regional institutions.[47]

2. The International Coral Reef Initiative

108. The International Coral Reef Initiative is a partnership among Governments, international organizations, and non-governmental organizations to preserve coral reefs and related ecosystems by implementing chapter 17 of Agenda 21, and relevant international conventions and agreements. The activities of ICRI are facilitated by the International Coral Reef Action Network, an operational network established in 2000. The Network has created a globally integrated action plan to manage and protect coral reefs, thereby supporting the implementation of the call and framework for action adopted under ICRI and other internationally agreed goals, objectives, targets and commitments related to coral reefs. Since 2004, ICRI has been also addressing cold-water corals.

D. Areas where cooperation and coordination could be strengthened

109. In spite of current efforts towards cooperation and coordination, efforts to that end could be strengthened. In particular, international cooperation to support marine scientific research was identified at the first meeting of the Working Group as fundamental to the consideration of issues related to marine biodiversity. The need to promote cooperation and coordination for both multi-purpose and specific marine scientific research to improve the understanding of marine biodiversity and therefore facilitate better informed policy and decision-making, was specifically highlighted. A more direct connection between increased scientific knowledge and the policy debate on marine biodiversity conservation and management was called for (see A/61/65, paras. 63-67).

110. One of the core recommendations of the International Seabed Authority Workshop on the development of environmental guidelines for deep seabed polymetallic exploration, held in Sanya, China from 1 to 5 June 1998, was for the Authority to work with the international scientific community and contractors, to identify critical issues for international collaboration, which would encourage cooperation and would be cost-effective. Another International Seabed Authority Workshop on prospects for international collaboration in marine environmental research to enhance understanding of the deep sea environment, held in Kingston, from 29 July to 2 August 2002, was specifically aimed at identifying the prospects for international collaboration in marine scientific research, and led to the development of the Kaplan project as well as efforts to establish other avenues for international collaboration (see ISA/13/A/2, paras. 59, 60 and 67).

[47] Report of the first meeting of the Group of Experts (28-30 March 2007, Paris), GRAME/GOE/1/7. See also A/59/62; A/60/63; and A/62/66/Add.1.

111. The Census of Marine Life and InterRidge are examples of cooperative international research programmes. The Census of Marine Life is a global network of researchers engaged in an initiative to explain the diversity, distribution and abundance of marine life in the oceans, with a strong focus on deep sea species. InterRidge is an international organization the objective of which is to develop oceanic ridge research in a cost-effective and cooperative manner (see also paras. 56 and 274 of the present report; and A/60/63/Add.1, paras. 46-47). More generally, in relation to biodiversity science, an international consultation is ongoing to assess the need, scope and possible forms of an International Mechanism of Scientific Expertise on Biodiversity (see http://www.imoseb.net).

112. Another area in which the importance of international cooperation for the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction has been underlined is through capacity-building and the transfer of marine technology (see A/61/65, paras. 68-70; see also paras. 243-248 below).

113. In its contribution to the present report, Mexico proposed that international cooperation be promoted to support marine scientific research through exchange and dissemination of information, upgrading of marine technology and funding for studies. According to Mexico, such research should involve a number of States so as to build capacity and foster consensus on the management of biodiversity beyond areas of national jurisdiction. The findings of research conducted in those areas should be made public and a mechanism for sharing findings should be developed. In addition, the possibility of inviting countries to participate in research studies, including as observers, should be explored. RFMOs should also play a role in research on marine biodiversity involving both species that fall within their purview and by-catch species. Peru, in its contribution, pointed out the importance of international cooperation to increase developing countries' capacity to, inter alia, conduct scientific research, as noted, in General Assembly resolution 61/222, sections II and XI. To this end, it is important for donor agencies and international financial institutions to keep their programmes systematically under review to ensure availability of relevant skills in all States.

114. For example, GEF provides opportunities for cooperation in capacity-building. Areas of focus of GEF projects include the conservation and sustainable use of biodiversity, including marine biodiversity, and international waters. While GEF funding is primarily addressed at biodiversity projects within areas of national jurisdiction, further consideration could be given to increasingly utilizing GEF funding for areas beyond national jurisdiction.

115. Mexico also proposed that exchange of information was needed concerning accidents involving vessels on cold-water coral reefs and the development of economic assessment techniques for both restoration and non-use values of coral reef systems. Ecuador, in its submission, underlined the need for further cooperation to: establish and maintain databases of information within national and regional institutions which have management plans or programmes on biodiversity beyond areas of national jurisdiction; promote cooperation among coastal States to prevent environmental pollution, including pollution from fishing vessels operating beyond areas of national jurisdiction; strengthen management measures currently implemented by various regional or national institutions, through global measures as well as through scientific/technical support to strengthen or assist national capacity-building; promote the active involvement of Governments in monitoring the

activities of fishing fleets operating adjacent to areas of national jurisdiction, with a view to further develop a register of fishing vessels operating in those areas and establishing a database of information on fishing activities and landings; recommend management measures for fishing activities beyond areas of national jurisdiction in accordance with the different fisheries resources available; enhance the capacity of coastal States in developing management and control measures for straddling and highly migratory species and landings from areas under their jurisdiction; and establish measures on the regulation of the size and weight of key commercial species and post-landing controls.

116. In order to promote transparency and accountability, Canada, in its contribution to the present report, proposed that the results of the meetings of the UN-Oceans Task Force on Biodiversity in Marine Areas Beyond National Jurisdiction should be made available, in particular to enable the international community to know the source of information/advice resulting from those meetings and thus allow for an informed discussion on such information/advice. The same approach should apply to the results of the meetings of the newly established UN-Oceans Task Force on Marine Protected Areas and Other Area-based Management Tools.

IV. The role of area-based management tools

117. Area-based management tools can have a wide variety of management objectives, including the preservation of important ecological or geomorphologic processes, the conservation and management of species, the protection of beautiful seascapes, cultural, archaeological or historic sites, recreation and public enjoyment, environmental monitoring and assessment, and scientific research. As such, area-based management tools have the potential to conserve ecosystems that are unique, particularly rich in species, or representative of biogeographical units. They may also help maintain ecosystem productivity and biodiversity.

118. Area-based management tools are designed to achieve one or more of these objectives by managing the pressures from human uses, such as fishing and shipping, which negatively impact or have the potential to negatively impact the ecosystem and resources of a geographically defined area. The degrees of protection which can be adopted in such areas are very different, ranging from areas of strict protection where uses are excluded to areas where multiple uses are allowed and regulated (see A/57/37). As a result, area-based management tools are a useful tool to implement an ecosystem approach as well as a precautionary approach.

119. Marine areas beyond national jurisdiction cover an estimated 64 per cent of the world's oceans (see UNEP/CBD/W6-PA/1/INF.1, para. 3). Only a limited portion of these areas is subject to area-based management, yet, an increasing number of international instruments, including conventions, plans of action and declarations, have recognized the contribution of area-based management tools to the protection and preservation of the marine environment and the sustainable use of its resources, including beyond areas of national jurisdiction.

120. The implementation of any area-based management tool beyond areas of national jurisdiction should be consistent with the provisions of UNCLOS related to the high seas and the Area. The general obligation to protect and preserve the marine environment under UNCLOS (art. 192) provides a basis for the

implementation of area-based management. To that end, States must take, individually or jointly, all necessary measures to prevent, reduce and control pollution from various sources (arts. 194 and 196). Among those measures are those necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life.

121. The types of area-based management tools available under the existing regulatory and policy frameworks are presented in section A below. Some of the implementation issues related to the use of area-based management tools beyond areas of national jurisdiction are addressed in section B below.

A. Types of area-based management tools and their regulatory framework

122. The present section provides an overview of the various types of area-based management tools currently available to achieve the objectives outlined in paragraphs 117 and 118 above. Some of these tools do not explicitly or currently apply beyond areas of national jurisdiction, but nevertheless could have a role in managing such areas.

123. A number of expressions are used to refer to the various area-based management tools presently in use. These include: "marine protected areas"; "specially protected areas"; "spatial and temporal closures" in the fisheries context; "special areas" and "particularly sensitive sea areas" in the shipping context; "sanctuaries"; and "reserves". Understanding the implications of and differences among these tools is important to facilitate, where necessary, their use in a complementary manner for an integrated management of a specific area.

1. Protected areas

124. The terms "marine protected areas"[48] and "specially protected areas" cover a wide range of area-based management tools, which provide a higher level of protection of the biodiversity and critical habitats of clearly delineated areas as compared to the surrounding areas. The primary goal of a protected area is to protect and conserve the biodiversity and productivity of that area, including ecological life support systems, such as breeding grounds. However, protected areas can be established for a variety of complementary/additional objectives, including those outlined in paragraphs 117 and 118 above. In order to establish a protected area, it is necessary to identify criteria for the selection of the area (see paras. 163-171 below).

[48] In the context of the Convention on Biological Diversity, the Ad Hoc Technical Expert Group on Marine and Coastal Protected Areas, established by the Conference of the Parties in 2000, proposed the following definition: "any defined area within or adjacent to the marine environment, together with its overlying waters and associated flora, fauna, and historical and cultural features, which has been reserved by legislation or other effective means, including custom, with the effect that its marine and/or coastal biodiversity enjoys a higher level of protection than its surroundings".

125. The World Conservation Union (IUCN) has defined a protected area[49] and a series of six associated management categories of protected area, based on primary management objectives (available from http://www.iucn.org/themes/wcpa). According to these categories, strict nature reserves are used primarily for scientific research and/or environmental monitoring. Wilderness areas are managed and protected to preserve their natural condition. National parks are designated to protect the ecological integrity of one or more ecosystems, exclude exploitation or occupation inimical to the purposes of designation of the area, and provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities. Natural monuments are managed mainly for conservation of specific natural features. Habitat/species management areas are subject to active intervention for management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species. Protected landscapes/seascapes are managed for landscape/seascape conservation and recreation. Managed resource protected areas are managed to ensure long-term protection and maintenance of biodiversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

126. Owing to the fluid and transient nature of the marine environment and its resources, a representative network of protected areas has been promoted in several forums, including the Convention on Biological Diversity, as offering the best form of biodiversity protection. A representative network of protected areas refers to the selection and protection of significant ecosystem types in a country or region, possibly linked by ecological corridors. In such cases, the conservation of biodiversity is best achieved if the protected areas included in the network represent all species and habitat types. Networks may comprise either many relatively small sites, each strictly protected, or fewer large-scale multiple-use areas encompassing a complete marine ecosystem or a large part thereof and containing strictly protected areas within them. Different uses and degrees of protection may be provided for within a single large-scale area.[50] Protected areas, as a result, are one of the tools that can be used to implement integrated ocean management and ecosystem approaches.

127. In addition to UNCLOS, several international instruments address specific issues related to the conservation and sustainable use of biodiversity, seascapes of

[49] IUCN has proposed the following definition of a protected area: "an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means". Specifically with reference to MPAs, it has adopted the following definition: "any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or the entire enclosed environment". Resolution 17.38 of the IUCN General Assembly (1988), reaffirmed in resolution 19.46 (1994).

[50] With regard to MPAs within national jurisdiction, the seventh meeting of the CBD Conference of the Parties, in decision VII/5, annex I, appendix 3, stated that integrated networks of marine and coastal protected areas (MCPAs) are part of an effective marine and coastal biodiversity management framework consisting of: MCPAs, where threats are managed for the purpose of biodiversity conservation and/or sustainable use and where extractive uses may be allowed; and representative MCPAs, where extractive uses are excluded, and other significant human pressures are removed or minimized, to enable the integrity, structure and functioning of ecosystems to be maintained or recovered (UNEP/CBD/COP/7/21).

particular importance and natural heritage, including through the establishment of protected areas.

128. At the global level, the Convention on Biological Diversity, which applies to processes and activities, regardless of where their effects occur, carried out under the jurisdiction or control of States within or beyond areas subject to national jurisdiction (art. 4), requires its parties to cooperate directly, or through competent international organizations for the conservation and sustainable use of biodiversity (art. 5). Article 8 on "In-situ conservation" requires, inter alia, contracting parties, as far as possible and as appropriate, to establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity. Programme element 3 of the elaborated programme of work on marine and coastal biological diversity related to marine and coastal protected areas, includes among its objectives, inter alia, the establishment and strengthening of national and regional systems of marine and coastal protected areas integrated into a global network, and the enhancement of the conservation and sustainable use of biodiversity in marine areas beyond the limits of national jurisdiction (see UNEP/CBD/COP/7/21, annex, decision VII/5, annex I).

129. As regards options for cooperation for the establishment of MPAs beyond areas of national jurisdiction, by decision VIII/24 on protected areas, the Conference of the Parties to the Convention on Biological Diversity recognized the General Assembly's central role in addressing issues relating to the conservation and sustainable use of biodiversity beyond areas of national jurisdiction. It noted the work and the report of the Working Group and possible options and approaches identified in the summary of trends prepared by the Co-Chairpersons of the Group, in particular for establishing MPAs beyond areas of national jurisdiction (see UNEP/CBD/COP/8/31, annex I). An Expert Workshop on ecological criteria and biogeographic classification systems for marine areas in need of protection is being convened pursuant to decision VIII/24 and will be held from 2 to 4 October 2007 in the Azores, Portugal (see also para. 168 below). The establishment of MPAs is also among the options identified in decision VIII/21, entitled "Marine and coastal biological diversity: conservation and sustainable use of deep seabed genetic resources beyond the limits of national jurisdiction" (ibid., decision VIII/24) with the need for further work on developing possible options, in particular within the framework of the United Nations.

130. In paragraph 32 (c) of the Johannesburg Plan of Implementation, States committed to developing and facilitating "the use of diverse approaches and tools, including (...) the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012".[33]

131. Since 2002, the General Assembly has also consistently called upon States to develop and facilitate the use of diverse approaches and tools for conserving and managing vulnerable marine ecosystems, including the possible establishment of MPAs, consistent with international law and based on the best scientific information available, and the development of representative networks of any such MPAs by 2012 (resolution 57/141, paras. 51 and 53; 59/240, para. 54; 59/24, para. 72; 60/30, para. 74; and 61/222, para. 97).

132. Regional instruments, which apply to a specifically delineated marine area within a region, embody a large-scale area-based management approach. Some of

them provide for species-specific protection measures, including through the protection of their habitats, while others more generally aim at the protection and preservation of the marine environment. A number of regional instruments are complemented by annexes, protocols or decisions of their governing bodies specific to marine biological diversity, including provisions on marine or specially protected areas. Work is ongoing, in several regions, on the establishment of such areas. In some cases, the coverage of such instruments extends beyond areas of national jurisdiction. In such cases, it is usually stated that the establishment of protected areas shall not affect the rights of other parties or third States under international law.[51]

133. For example, the 1976 Protocol concerning Specially Protected Areas and Biological Diversity to the Barcelona Convention applies to the area of the Mediterranean Sea as defined in article 1 of the Barcelona Convention, which covers both the waters and the seabed and its subsoil (art. 2). The Protocol provides, among others, for the establishment of a list of Specially Protected Areas of Mediterranean Interest (SPAMI) (art. 8.2). Areas located partly or wholly beyond areas of national jurisdiction can be proposed for listing on the SPAMI list by two or more neighbouring parties concerned. One of the areas on the SPAMI list, which straddles areas within and beyond national jurisdiction, is the Pelagos Sanctuary for Marine Mammals (see para. 151 below).[52]

134. The Convention for the Protection of the Natural Resources and Environment of the South Pacific Region (Noumea Convention), which includes areas of the high seas enclosed from all sides by the parties' EEZ (art. 2 (a)), provides for the establishment of specially protected areas (art. 14). It is not explicitly stated that the Convention also applies to the seabed underlying these areas but seabed activities are addressed in articles 8 and 13 of the Convention. Information currently available suggests that no MPAs have been established beyond areas of national jurisdiction pursuant to the Noumea Convention.

135. In the North Atlantic, annex V to the OSPAR Convention[53] and the accompanying Sintra Ministerial Statement (22-23 July 1998) provide a strategy for the protection and conservation of the ecosystems and biodiversity of the OSPAR area, including through the establishment of a network of MPAs. In a joint ministerial declaration of June 2003, the parties to the OSPAR Convention and to the Convention on the Protection of the Marine Environment of the Baltic Sea Area, which only applies to the internal waters of its parties, recommended the establishment of a network of well-managed and ecologically coherent MPAs by 2010 (see document JMM 2003 (3)). The revised 2003

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[51] See the 1976 Protocol concerning Specially Protected Areas to the Barcelona Convention, art. 28.

[52] Approximately 53 per cent of the areas on the SPAMI list lies beyond areas of national jurisdiction.

[53] The Convention applies to the area situated not only within the internal waters, territorial sea and EEZ of its contracting parties but also to a significant proportion of the high seas and the underlying seabed and subsoil in the North East Atlantic and Arctic Oceans, as delineated by the Convention (art. 1 (a)).

OSPAR strategy includes guidelines for identifying and selecting sites, and for managing MPAs.[54] The strategy calls for consultation with the competent international organizations regarding the OSPAR area beyond national jurisdiction. Guidance on Developing an Ecologically Coherent Network of OSPAR MPAs was also developed (see document 2006-3). No proposals have been received so far for the establishment of MPAs beyond areas of national jurisdiction and, at its last meeting, the OSPAR Commission agreed that OSPAR should continue to intensify its efforts to identify sites in need of protection in these areas, such as the Charlie Gibbs Fracture Zone/Mid Atlantic Ridge. The meeting also endorsed a list of future OSPAR work on marine spatial management.[55]

136. With regard to the Antarctic, annex V to the Madrid Protocol provides for the establishment of two types of protected areas, which can include "any marine area" (arts. 3 and 4). Antarctic Specially Protected Areas can be established to protect outstanding environmental, scientific, historic, aesthetic or wilderness values, or ongoing or planned scientific research. Antarctic Specially Managed Areas can be established to assist in the planning and coordination of activities in congested areas where conflicts of use may arise, or to minimize cumulative environmental impacts. The Committee for Environmental Protection, in its provisional five-year workplan, placed high priority on the identification of processes for the designation of MPAs.[56]

2. Area-based management of fisheries

137. Spatial and temporal closures and gear restrictions for specific areas to protect fish stocks and other vulnerable species have been used as a tool in conventional fisheries management for a long time. Under article 62 (4) of UNCLOS, coastal States, in conserving the marine living resources within their EEZ, can use measures such as the regulation of seasons and areas of fishing. In the high seas, article 119 requires States, when determining the allowable catch and establishing other conservation measures, to take measures to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, and take into consideration the effects on species associated with or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species above levels at which their reproduction may become seriously threatened. This can be achieved, inter alia, through the use of area-based management tools.

138. The 1995 Fish Stocks Agreement provides for the adoption of conservation and management measures for target stocks and species belonging to the same ecosystem or associated with or dependent upon the target stocks; it requires that fishing States minimize pollution, waste, discards, catch by lost or abandoned gear, catch of non-target species and the adverse impacts of fishing on associated or

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[54] 2003 Strategy of the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic (document 2003-21); Guidelines for the Identification and Selection of MPAs in the OSPAR Maritime Area (document 2003-17); and Guidelines for the Management of MPAs in the OSPAR Maritime Area (document 2003-18).

[55] OSPAR Commission, 2005/2006 Report on the Status of the OSPAR Network of MPAs (2006), Summary Record of the 2007 meeting of the OSPAR Commission (OSPAR 07/24/1-E).

[56] Report of the Committee for Environmental Protection (CEP X) Appendix 1: Provisional Five Year Work plan for the CEP, available from http://30atcm.ats.aq/30atcm/Documents/Docs/att/Atcm30_att084_rev1_e.doc.

dependent species, in particular endangered species, through the development and use of selective, environmentally safe and cost-effective gear and techniques; and it further requires the protection of biodiversity in the marine environment (art. 5). States must apply widely the precautionary approach and develop data-collection and research programmes to assess the impact of fishing on non-target and associated or dependent species and their environment. They must also adopt plans to ensure the conservation of such species and to protect habitats of special concern (art. 6).

139. The Review Conference on the 1995 Fish Stocks Agreement, held in New York, from 22 to 26 May 2006 (the Review Conference) in its recommendations relating to the conservation and management of stocks, highlighted that: "Closed areas, marine protected areas and marine reserves can be effective tools for the conservation and management of some fish stocks and habitats of special concern. Some regional fisheries management organizations have utilized closed areas both to manage fisheries and to protect habitats and biodiversity" (A/CONF.210/2006/15, annex, para. 15). The Conference recommended that States, individually and collectively through RFMO/As: "Develop management tools, including closed areas, marine protected areas and marine reserves and criteria for their implementation, to effectively conserve and manage straddling fish stocks, highly migratory fish stocks and high seas discrete stocks and protect habitats, marine biodiversity and vulnerable marine ecosystems, on a case-by-case basis in accordance with the best available scientific information, the precautionary approach and international law" (ibid., para. 18 (e)).

140. The FAO Code of Conduct, a non-binding international instrument, establishes as one of its general principles the protection and rehabilitation of all critical fisheries habitats in marine and freshwater ecosystems, such as reefs and nursery and spawning grounds. It stresses that particular efforts should be made to protect such habitats from destruction, degradation, pollution and other significant impacts resulting from human activities that threaten the health and viability of fishery resources (para. 6.8). The Code further provides for States to take appropriate measures to minimize waste, discards, catch by lost or abandoned gear, catch of non-target species, both fish and non-fish species, and negative impacts on associated or dependent species, in particular endangered species. Such measures, which should be applied to protect juveniles and spawners, may include closed seasons and areas and zones reserved for selected fisheries, particularly artisanal fisheries (para. 7.6.9). The Code further provides for States and RFMO/As, within their respective competences, to introduce measures for depleted resources and those resources threatened with depletion that facilitate the sustained recovery of such stocks, and to ensure that fishery resources and habitats critical to the well-being of such resources which have been adversely affected by fishing or other human activities are restored (para. 7.6.10).

141. As regards the role of MPAs in the context of fisheries, it has been recognized that, if properly implemented, protected areas can lead to higher densities, biomass, mean size of organisms and diversity of species within their boundaries, although this general result is influenced by factors such as the species composition, the nature and intensity of the activities being displaced by the restrictions inside the area and fishing intensity outside the protected area. In some cases, MPAs have been clearly found to have some benefits for fisheries performance beyond their boundaries, but the potential role of MPAs in this regard needs to be carefully

evaluated in comparison to other management tools, on a case-by-case basis, taking into account the objectives being pursued, the relevant local biological and ecological characteristics and the nature and spatial characteristics of the fishery and the people dependent on it.[57]

142. As recommended by COFI at its twenty-sixth session, and reaffirmed at the twenty-seventh session, technical guidelines on the design, implementation and testing of MPAs are being developed, building on the best available knowledge on fisheries science and management and the role and requirements of MPAs, with particular emphasis on their potential contribution to the ecosystem approach to fisheries, in order to assist members with meeting the World Summit on Sustainable Development goal of representative MPA networks by 2012. In order to facilitate this work, the FAO Expert Workshop on Marine Protected Areas and Fisheries Management: Review of Issues and Considerations, held in Rome from 12 to 14 June 2006, agreed that MPAs as a fishery management tool: contribute to achieving conservation and sustainability objectives of fisheries management while contributing to biodiversity and habitat conservation; are temporally and geographically specified in three dimensions for a portion of the geographic range of the fishery management unit; afford fishery resources a higher degree of protection within the geographic boundaries of the MPA than the resource is afforded elsewhere within the geographic range of the fishery management unit; are established through legally binding mechanisms and/or other effective means; and usually have resource conservation and sustainability benefits, other ecological benefits, and/or social benefits, beyond the boundaries of the MPA. The Workshop also concluded that networks should also be employed, rather than a single MPA (see para. 126 above).[58]

143. The Workshop considered that the guidelines to be developed by FAO should provide technical guidance on the potential advantages and disadvantages of MPAs as tools for fisheries management in relation to other tools, including beyond areas of national jurisdiction. MPAs on the high seas could address deep sea resources and communities, for example on seamounts and oceanic ridges, pelagic resources and communities, or both.[59]

144. As regards the use of area-based management tools by RFMOs, most of these organizations are subdivided into smaller geographic zones (fisheries management units) for the purposes of regulation, which means that requirements, for example, to use or prohibit certain types of gear, to restrict harvesting at certain depths, or to undertake carefully managed exploratory fishing, may be confined to these subdivisions and thus, de facto, protect particular marine areas from certain types of fishing activities. Conservation measures available to RFMOs include closed areas and seasons, which may be temporary until, for example, further surveys are carried out and scientific advice is received, or to allow stock recovery; or long-term, for example, to protect fish spawning grounds and/or juvenile life-history stages (see UNEP/CBD/W6-PA/1/INF.2, para. 82).

[57] Implementing the ecosystem approach to fisheries, including deep-sea fisheries, biodiversity conservation, marine debris and lost or abandoned fishing gear (COFI/2007/8).

[58] See FAO Fisheries Report No. 825, sect. 5.2.

[59] Ibid., sect. 5.3.

145. Some examples of area-based management tools implemented by RFMOs follow.[60] The North East Atlantic Fisheries Commission has established closed areas on the Rockall and Hatton banks which are closed to bottom trawling and fishing with static gear, including fishing with bottom gill nets and long lines. The Commission has also established interim measures for the protection of vulnerable deep water habitats. Bottom trawling and fishing with static gear is prohibited in the Hecate and Faraday seamounts, a section of the Reykjanes Ridge, the Altair seamounts and the Antialtair seamounts. The Commission is furthermore initiating a process for the development of criteria and procedures for closing areas to fishing.

146. The Northwest Atlantic Fisheries Organization (NAFO) has decided to impose a ban on bottom trawling on seamounts in the North-west Atlantic. In addition, the NAFO Scientific Council has been requested to assess corals in the NAFO Convention Area, with a view to their future protection. The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) has used MPAs as a means of management, and agreed in 2006 to "freeze the footprint" on bottom trawling. The South East Atlantic Fisheries Organization (SEAFO) adopted, in 2006, urgent measures to prohibit until 2010 fishing activities in 10 marine areas with prominent seamounts to protect these habitats, pending experimental fisheries research activities that may be authorized by SEAFO on a limited scale.

147. The General Fisheries Commission for the Mediterranean has called for restrictions on fishing in some areas in order to protect sensitive deep sea habitats. It adopted recommendations requiring members to prohibit the use of towed dredges in trawl-net fisheries at depths greater than 1,000 metres, and prohibiting the use of bottom-trawls and dredges in three specific areas to protect corals, cold hydrocarbon seeps and seamounts (i.e., *Lophelia* reefs off Capo Santa Maria di Leuca, Nile Delta cold hydrocarbon seeps and Eratosthenes Seamounts) (see A/61/154, para. 159).

3. Area-based management tools for other marine species

148. The Convention on Migratory Species is concerned with the conservation of those species of wild animals that migrate both across and beyond areas of national jurisdiction. The Convention, which operates through a listing system, puts great emphasis on the protection of habitats of migratory species and regional cooperation. Area-based management tools, such as migratory corridors, are an efficient way of achieving the protection required under the Convention. Several migratory marine species are listed on the Convention on Migratory Species appendices and a number of regional agreements and memorandums of understanding have been adopted for some of those species.[61]

149. For example, the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas covers some areas beyond national jurisdiction in the North Sea. The identification of areas of special importance to the breeding and feeding of small cetaceans is among the measures required under the Convention (annex). The

[60] Contribution of Norway to the present report.

[61] These include the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area, the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas, the Agreement on the Conservation of Albatrosses and Petrels, the Memorandum of Understanding concerning Conservation Measures for Marine Turtles of the Atlantic Coast of Africa; and the Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia.

parties to the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area undertake to adopt measures prohibiting large-scale driftnets in the Agreement's area and to establish and manage specially protected areas that serve as habitat or provide important food resources for cetaceans. These should be established within the framework of the Barcelona Convention and the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean or other appropriate instruments (see annex 2 to the Agreement).

150. Under the Convention on Biological Diversity programme of work on protected areas, the Executive Secretary of the Convention is required to review the potential for regional cooperation under the Convention on Migratory Species with a view to linking protected area networks across international boundaries and potentially beyond national jurisdiction through the establishment of migratory corridors (see UNEP/CBD/COP/7/21, annex, decision VII/28, annex).

151. Under the Pelagos Sanctuary Agreement (see para. 75 above), parties shall "guarantee a favourable conservation status of sea mammals while protecting also their habitats and preventing negative direct or indirect impacts of human activities" (art. 4). Any deliberate "taking" or disturbance directed at marine mammals is prohibited (art. 7), and watching them for touristic purposes is regulated (art. 8). To that end, each party to the Agreement plans its policies and management projects in consultation with the other parties, with reference to a jointly adopted management plan. The sanctuary is listed as a SPAMI (see para. 133 above), therefore extending the provisions of the Sanctuary to all the parties to the Barcelona Convention.

152. The International Whaling Commission established two sanctuaries where commercial whaling is prohibited to allow for recovery of whale species, which include areas of the high seas: the Indian Ocean Sanctuary, established in 1979 for a duration of 10 years, which has since been extended twice; and the Southern Ocean Sanctuary, established in 1994 and extended for 10 years in 2004.

4. Area-based management of the impacts of shipping activities

153. Area-based measures to manage the impacts of shipping activities can be adopted by IMO. MARPOL 73/78, which aims to prevent pollution of the marine environment from ships, provides for the designation of "special areas" where the discharge of oil, noxious liquid substances and garbage (the substances listed in annexes I, II and V to MARPOL 73/78) is controlled more strictly than under the generally applicable international standards.[62] Annex VI to MARPOL 73/78 (Prevention of air pollution from ships) provides for the possibility of designating "sulphur oxide emissions control areas". The Baltic Sea and the North Sea have been designated as sulphur oxide emissions control areas and encompass areas within national jurisdiction.

154. The IMO Guidelines for the Designation of Special Areas under MARPOL 73/78 (IMO resolution A.927(22)) provide guidance to MARPOL 73/78 parties in the formulation and submission of applications for the designation of special areas

[62] A "special area" is defined as: "a sea area where for recognized technical reasons in relation to its oceanographical and ecological conditions and to the particular character of its traffic, the adoption of special mandatory methods for the prevention of sea pollution by oil, noxious liquid substances, or garbage, as applicable, is required".

under the Convention. The criteria for an area to be given special area status are grouped into: oceanographic conditions, such as particular circulation patterns and extreme ice state; ecological conditions, such as critical habitats for marine resources and rare or fragile marine ecosystems; and vessel traffic characteristics. The extent to which the condition of a sea area is influenced by other sources of pollution, such as pollution from land-based sources, dumping of wastes and dredged materials, as well as atmospheric deposition, should also be taken into account. Two areas designated as special areas that include areas beyond national jurisdiction are the Antarctic and Southern Ocean (south of latitude 60 degrees south) and the Mediterranean.

155. In addition to special areas, the revised IMO Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas (PSSAs) (IMO resolution A.982(24)), set out procedures and criteria for the establishment of areas requiring special protection through action by IMO because of their significance for recognized ecological, socio-economic, or scientific attributes where such attributes may be vulnerable to damage by international shipping activities. PSSAs can be designated within and beyond the limits of the territorial sea. To date, all PSSAs lie in areas within national jurisdiction.

5. Area-based management of the impacts of mining

156. Article 145 of UNCLOS requires the International Seabed Authority to establish rules, regulations and procedures to ensure the effective protection of the marine environment, the protection and conservation of the natural resources of the Area and the prevention of damage to its flora and fauna from harmful effects that may arise from activities in the Area as defined in article 1. The Council of the Authority shall disapprove areas for exploitation in cases where substantial evidence indicates the risk of serious harm to the marine environment (art. 162 (2) (x)).

157. The establishment of impact reference zones and preservation reference zones is required under the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area in order to assess the effect of each contractor's activities on the Area's marine environment (see paras. 50 and 184 of the present report). Similar provisions are currently included in the draft regulations on prospecting and exploration for cobalt-rich ferromanganese crusts in the Area (see ISBA/13/LTC/WP.1) and the draft regulations on prospecting and exploration for polymetallic sulphides in the Area (see ISBA/13/C/WP.1).

6. Other area-based management tools and approaches

158. The present section provides examples of area-based management tools and approaches that are being explored and adopted at the national level, which might also be of interest for areas beyond national jurisdiction.

159. *Biosphere reserves*. Biosphere reserves are sites recognized under the UNESCO Man and the Biosphere Programme. While currently applicable to areas within national jurisdiction, biosphere reserves provide a useful example of approaches to reconcile conservation and sustainable development through an integrated management and zoning system, including a core area, a buffer zone and a transition zone where different degrees of protection are implemented. Only the core area requires legal protection and hence can correspond to an existing protected

area such as nature reserve or a national park. This zoning scheme is implemented in different ways to accommodate geographical conditions, socio-cultural settings, available legal protection measures and local constraints. This flexibility facilitates the integration of protected areas into the wider seascape (see http://www.unesco.org/mab/faq-br.(shtml)).

160. *Large marine ecosystems*. Large marine ecosystems (LMEs) are regions of the oceans encompassing coastal areas, including river basins and estuaries, to the seaward boundaries of continental shelves and the outer margins of the major current systems. LMEs are relatively large regions characterized by distinct bathymetry, hydrography, productivity, and populations depending on the same food chain. The LME approach provides an interdisciplinary framework for utilizing ecologically defined LMEs on the basis of a common strategy for assessing, recovering, managing, and sustaining marine resources and their environments (see also A/62/66/Add.1, para. 168).

161. *Marine spatial planning*. This concept was recently explored by an international workshop organized by UNESCO from 8 to 10 November 2006. The workshop described marine spatial planning as a tool for "analysing and allocating parts of three-dimensional marine spaces to specific uses, to achieve ecological, economic, and social objectives that are usually specified through the political process. Marine spatial planning is place- or area-based and can provide a practical approach to long-term ecosystem-based management. It should be comprehensive, adaptive, and participatory, and resolve conflicts among multiple uses in the ecosystem".[63]

B. Implementation of area-based management tools

162. As noted above, to date, the implementation of area-based management tools beyond areas of national jurisdiction has been limited. Lessons learnt from implementation of some of those tools at the national level may, however, provide guidance when considering the implementation of such measures beyond areas of national jurisdiction. Some considerations specifically related to areas beyond national jurisdiction should also be kept in mind, all of which are outlined in the present section.

1. Identification of areas

163. The first consideration in the implementation of area-based management tools is the identification of areas in need of protection. The scarcity or lack of scientific knowledge about the distribution of marine species and ecosystems beyond areas of national jurisdiction is a challenge for the identification of such areas. Socio-economic aspects should also be borne in mind (see also UNEP/CBD/COP/8/INF/16 and UNEP/CBD/COP/8/INF/34).

164. *Ecological and physical considerations*. The complex interrelationships and ecological processes that exist between species and the marine environment need to be studied in order to identify how to best maintain the integrity of these relationships and thus ensure the health of marine ecosystems.

[63] "Conclusions and Next Steps from the International Workshop on Marine Spatial Planning", available from http://ioc3.unesco.org/marinesp/files/FinalConclusionsNextSteps_041206.pdf.

165. Ecological processes that need to be taken into consideration include: physical processes, such as the movements of water, food and organisms by gravity, waves and currents; chemical processes, such as concentration and exchanges of gases and minerals; and biological processes, such as nutrient transfer from one trophic level to another. Ecological processes are often the result of the interaction among the physical, chemical and biological components, for example, nutrient cycling. Maintaining the integrity and productivity of marine ecosystems requires consideration of all such interactions.

166. As mentioned above, some instruments already provide criteria for the identification of areas in need of special protection, for example, the IMO Guidelines (see paras. 154-155 above). The development of a set of scientifically rigorous criteria for the identification of ecologically or biologically significant areas beyond national jurisdiction was the goal of the international workshop organized by the Government of Canada in December 2005. Ecologically or biologically significant areas were defined as geographically defined areas that have higher significance to one or more species of an ecosystem or to the ecosystem as a whole, compared to other areas of similar bathymetric, latitude, and general ecological characteristics (see A/AC.259/16, available from http://www.un.org/depts/los/consultative_process/consultative_process.htm).

167. International efforts are also focusing on the establishment and/or improvement of biogeographic criteria for the classification of open and deep ocean areas. A scientific experts' workshop on biogeographic classification systems in open ocean and deep seabed areas beyond national jurisdiction was held at the National University of Mexico in Mexico City, from 22 to 24 January 2007. This workshop provided an essential first step towards developing a comprehensive biogeographic classification of open ocean and deep seabed areas beyond national jurisdiction based on the latest information made available from expert scientists.

168. The Convention on Biological Diversity Expert Workshop on ecological criteria and biogeographic classification systems for marine areas in need of protection referred to in paragraph 129 above, will refine and develop a consolidated set of scientific criteria for identifying ecologically or biologically significant marine areas in need of protection, in open ocean waters and deep sea habitats, building upon existing sets of criteria used nationally, regionally and globally. It will also compile biogeographical and ecological classification systems for delineating ocean regions and ecosystems, building on existing broad classification systems, and including more detailed subregional classification systems where they exist, and initiate future development by making recommendations for further work to fill gaps. It will further compile a consolidated set of scientific criteria for representative networks of MPAs, including in open ocean waters and deep sea habitats.

169. The study and monitoring of biodiversity requires close consideration of its fundamental geographic components, and thus cartography and mapping are essential tools. For example, the FAO species identification guides and catalogues include distribution charts together with other information about species biology and fisheries. The most recent distribution maps are produced using Geographic Information System technology, contributing to a collection of electronic geo-referenced maps of considerable potential value for biodiversity mapping and analyses. The consolidation of these maps allows the identification of biodiversity

regions and hotspots, which are areas of the oceans rich in biodiversity, allows a better understanding of ecosystem functioning and provides the basis for the application of some fishery management regulations, such as those involving time or area closures and MPAs. Also, maps produced in different periods (the first FAO species distribution charts date back to 1973) provide time changes and biodiversity trends (see FAO document COFI/2007/8, para. 17).

170. *Socio-economic considerations*. These considerations are an essential element to be taken into account in the process of implementing area-based management tools. Major users/stakeholders, their activities and impacts of such activities in areas under consideration need to be identified through a stakeholder analysis. Such analyses are aimed at: better understanding the complexity of the ecosystem; understanding the human influence on the ecosystem and its management; examining the compatibility and/or (potential) conflicts of multiple use objectives; identifying, predicting and resolving areas of conflict; and discovering existing patterns of interaction.[64]

171. A report by UNU has identified several potential stakeholders, and conflicts arising among them, in respect of marine areas beyond the limits of national jurisdiction.[64]

2. Management plans

172. Implementing area-based management tools requires careful planning and management. The implementation of such tools, and in particular MPAs within national jurisdiction shows that successful management plans need to be carried out systematically using a holistic, interdisciplinary approach and with the support of relevant stakeholders.

173. The elaboration of a management plan includes several steps. Having established that an area needs specific protective measures, the most suitable area-based management tool/tools need to be identified. If the area is affected by more than one activity, the available tools addressing cumulative impacts (e.g., MPAs) should be considered. Relevant issues, such as environmental, social and institutional issues, and their implications for the management plan, should be identified and assessed, in consultation with all interested stakeholders. It is also necessary to conduct scientific research addressing selected management goals, document baseline conditions, conduct a public education programme, and identify the institutional framework by which the management plan will be implemented and create institutional capacity for its implementation. Testing implementation strategies at a pilot scale is also beneficial.[65]

174. The principle of adaptive management requires that implementation of the plan be kept flexible and strategies modified, as needed, by monitoring the efficacy of the plan. Compliance is a crucial aspect of the plan and should therefore be promoted.

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[64] *Implementing the Ecosystem Approach in Open Ocean and Deep Sea Environments: An Analysis of Stakeholders, their Interests and Existing Approaches* (UNU Institute of Advanced Studies, 2006).

[65] Draft Training Manual on the Development, Implementation and Management of Marine Protected Areas, Division for Ocean Affairs and the Law of the Sea, United Nations, 2007.

3. Compliance and enforcement mechanisms

175. In order to achieve their objectives, area-based management tools need to be accompanied by effective compliance and enforcement mechanisms. To a certain extent, area-based management provides advantages for enforcement, owing to the specifically defined geographical area to which measures apply. It is also important to note that surveillance and enforcement activities beyond areas of national jurisdiction are logistically difficult and expensive.

176. Pursuant to UNCLOS, the enforcement of international instruments beyond areas of national jurisdiction is primarily the responsibility of the flag State. However, effectiveness of flag State enforcement is contingent upon States effectively exercising control over ships flying their flag (see paras. 78-79, 303-306 and 319-323 of the present report). Port State control is also provided for (see paras. 179-180, 304 and 324-325 below).

177. In order to strengthen enforcement in relation to fisheries on the high seas, the 1995 Fish Stocks Agreement elaborates the provisions of the Convention relating to flag States duties and enforcement by flag States (see arts. 18 and 19 of the Agreement, respectively), and provides for a detailed regime for international cooperation in enforcement (art. 20), in particular enforcement at the subregional and regional levels and by port States (arts. 21 and 23). As a result, the primary responsibility of the flag State is complemented by a framework for action by States other than the flag State, for example in the form of a right to board and inspect vessels in support of subregionally, regionally or globally agreed conservation and management measures (art. 21). In this context, the Agreement provides a key role to RFMO/As as the appropriate medium through which States are required to cooperate to achieve and enforce conservation objectives.

178. The FAO Compliance Agreement, which applies to all fishing vessels fishing on the high seas, was also adopted to improve monitoring, control and enforcement by flag States. It sets out flag State responsibilities to ensure that a fishing vessel flying its flag and engaged in high seas fishing complies with international conservation and management measures. Port States may also take investigatory measures to establish whether a fishing vessel voluntarily in its ports has violated the Agreement's provisions (arts. II, III and V). Flag States must maintain a record of vessels entitled to fly their flag and authorized to fish on the high seas and communicate it to FAO, which has established a High Seas Vessels Authorization Record.

179. Port State enforcement is also foreseen in UNCLOS with regard to the protection and preservation of the marine environment beyond areas of national jurisdiction (art. 218). In particular, the port State can, in certain circumstances, take enforcement measures for discharges in violation of anti-pollution regulations, irrespective of where the violation occurred.

180. Regional and global arrangements strengthen the role of port States in promoting compliance with international rules, regulations and standards for shipping and fisheries, among others. These include memorandums of understanding on port State control and efforts through IMO and FAO. In response to General Assembly resolution 61/105, paragraph 43, COFI, at its twenty-seventh session, took note of the strong support for a proposal to develop a new legally binding instrument based on the Model Scheme on Port State Measures to Combat Illegal,

Unreported and Unregulated Fishing and the International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing and agreed that a finalized text would be presented to COFI at its twenty-eighth session in 2009.[66]

181. Enforcement in areas benefiting from special protection can be strengthened by, inter alia, the issuance of licences and permits, electronic charting to facilitate identification of sites and associated protective measures, use of vessel monitoring systems, satellite navigation systems, and IMO requirements for automatic identification systems for ships (transponders on board). Inspection and observer systems can also support compliance with the protective measures adopted for a particular area.[67]

4. Research, monitoring and assessment

182. Research, monitoring and assessments are key to the success of area-based management. Monitoring allows, for example, adapting management measures in the face of changing ecological, environmental and social circumstances.

183. UNCLOS provides for monitoring and environmental impact assessments (arts. 204-206). In particular, States are required to monitor the risks or effects of pollution on the marine environment and publish reports of the results obtained, as well as to conduct assessments of and report on activities planned under their jurisdiction or control that may cause substantial pollution of or significant and harmful changes to the marine environment. Article 14 of the Convention on Biological Diversity requires the parties to introduce procedures for environmental impact assessments of projects that are likely to have significant adverse effects on biological diversity.

184. In some cases, specific areas can be designated for the purposes of research and monitoring. For example, under the Regulations on Prospecting and Exploration for Polymetallic Nodules in the Area, adopted by the International Seabed Authority, a contractor applying for exploitation rights is required to set aside "impact reference zones" and "preservation reference zones". Impact reference zones are areas to be used for assessing the effect of each contractor's activities on the Area's marine environment and which are representative of the environmental characteristics of the Area. Preservation reference zones are "areas in which no mining shall occur to ensure representative and stable biota of the seabed in order to assess any changes in the flora and fauna of the marine environment" (see ISBA/6/A/18, annex, Regulations 2, 31 (3), 31 (4) and 31 (7)).

185. Biosphere reserves (see para. 159 above) also provide a tool for research and monitoring through the zoning system. These areas provide useful reference points for adaptive management.[68]

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[66] Report of the FAO Committee on Fisheries at its twenty-seventh session, Rome, 5-9 March 2007, FAO Fisheries Report No. 830.

[67] See for example, the text of the CCAMLR System of Inspection at http://www.ccamlr.org/pu/e/e_pubs/bd/pt9.pdf, and art. 14 of the Madrid Protocol.

[68] http://www.unesco.org/mab/BRs.shtml.

186. At the regional level, under CCAMLR, the CCAMLR Ecosystem Monitoring Programme sites[69] have been designated for the purposes of: detecting and recording significant changes in critical components of the marine ecosystem within the Convention Area, to serve as a basis for the conservation of Antarctic marine living resources; and of distinguishing between changes due to harvesting of commercial species and changes due to environmental variability, both physical and biological. Each site has a Management Plan which must be complied with (see http://www.ccamlr.org/pu/e/e_pubs/bd/pt10.pdf).

V. Genetic resources beyond areas of national jurisdiction

187. Genetic resources are any material of plant, animal, microbial or other origin containing functional units of heredity of actual or potential value (see Convention on Biological Diversity, art. 2). Because of their dependence on and connection to genetic information, proteins, other biopolymers, and small organic molecules with adaptive functions produced by genes, known as secondary metabolites, can also be considered as marine genetic resources (see A/62/66, para. 133).

188. Unlike fish, marine genetic resources are not collected as a source of food but for the information they harbour, which can be replicated and exploited. Genes and their products have become an important information resource, not only in the field of aquaculture, but in all areas of biotechnology, such as pharmaceuticals and industrial processes. Recent discoveries have shown that further knowledge on the origins of life on Earth could also be gained from further studies of marine genetic resources.[70]

189. It is important to note that resources in the marine environment, including genetic resources, often straddle legal and political boundaries owing to the fluid and transient nature of the marine environment. Organisms found within areas of national jurisdiction at some point may later be found beyond areas of national jurisdiction, as a result of ecological processes, including currents, larvae dispersal patterns, or following transportation through various pathways, such as ballast water. Several scientific, technological, economic and socio-economic, environmental and legal issues are therefore common to resources both within and beyond areas of national jurisdiction. To the extent possible, the present chapter focuses on those issues as they specifically relate to marine genetic resources located beyond areas of national jurisdiction at the moment of sampling or collection. Also it takes into account the discussions on marine genetic resources which took place at the first meeting of the Working Group and most recently at the eighth meeting of the Consultative Process where marine genetic resources was the topic of focus.

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[69] Sampling sites are located in: (i) three Integrated Study Regions where interactions between predators, prey, fisheries and the environment are examined in detail; and (ii) a network of additional sites which complement the research in the three ISRs. A map of the sites is available from http://www.ccamlr.org/pu/e/sc/cemp/isr.htm.

[70] *Bioprospecting of Genetic Resources in the Deep Seabed: Scientific, Legal and Policy Aspects* (United Nations University Institute of Advanced Studies, June, 2005).

A. Scientific issues

190. Marine genetic resources play a key role in the ecosystem services provided by the oceans. A previous report of the Secretary-General provides information on the supporting and regulating role of genetic resources in the oceans, including the provision of oxygen, climate regulation, the degradation of toxins and other pollutants, ocean biomass turnover, and the maintenance of marine biodiversity (A/62/66, paras. 158-159). These are relevant to both resources within and beyond areas of national jurisdiction. The present section focuses on the features of interest in the search for marine genetic resources, the geography of the sampling effort, and the nature of the scientific interest in marine genetic resources.

1. Features and organisms of interest in the search for marine genetic resources

191. The oceans are characterized by an exceptional range of ecosystems with complex structures and functions, few of which have been explored and studied to date. These can be broadly divided into the pelagic (water column) and benthic (seabed) ecosystems. The features and biodiversity associated with those ecosystems are described in addendum 1 to the 2005 report of the Secretary-General (A/60/63/Add.1, paras. 13-39). These ecosystems can be found both within and beyond areas of national jurisdiction and it is difficult to quantify, from the disparate and incomplete sources of data available, the exact proportion of those ecosystems located beyond areas of national jurisdiction.

192. It is believed that the species diversity of pelagic ecosystems is low compared to that of benthic ecosystems, with variations among the different benthic ecosystems types (ibid., para. 15). The water column is, however, extremely rich in microbes, which include bacteria, archae, fungi, yeasts, and viruses, and are thought to be the most genetically diverse organisms (A/62/66, para. 132). Approximately 95 per cent of the biomass in the oceans is estimated to be microbial.[71] The seafloor is thought to be the most biodiverse place on Earth in terms of macro-organisms.[72] Deep sea ecosystems are also characterized by a high diversity and biomass in bacteria, a high diversity in species assemblage, important spatial heterogeneity and extreme temporal instability owing to recurrent extinction-recolonization processes,[73] as well as natural processes such as undercurrents, volcanic eruptions, earthquakes and magmatic intrusions, which all have impacts on biological communities.[74]

193. Hot spots of diversity and biological activity in the oceans are found in areas associated with coral reefs, oceanic islands, seamounts and other topographic and

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[71] "The oceans are a vast reservoir of unexplored genetic diversity", presentation by Curtis Suttle at the eighth meeting of the Consultative Process, 25-29 June 2007, available from http://www.un.org/depts/los/consultative_process/consultative_process.htm.

[72] "Towards a practical knowledge base for marine genetic resources", presentation by Libby Evans-Illidge at the eighth meeting of the Consultative Process, available from http://www.un.org/depts/los/consultative_process/consultative_process.htm.

[73] "Ressources génétiques en environnement profound: exploitation, valorisation et conservation", presentation by Sophie Arnaud-Haond at the eighth meeting of the Consultative Process, available from http://www.un.org/depts/los/consultative_process/consultative_process.htm.

[74] "Responsible research at deep-sea hydrothermal vents promoted by the InterRidge Programme", presentation by Margaret Tivey at the eighth meeting of the Consultative Process, available from http://www.un.org/depts/los/consultative_process/consultative_process.htm.

hydrographic areas such as canyons and fronts. However, the history of novel products shows that such products are not necessarily based on organisms from biodiversity-rich areas. In particular, interest is generated by micro-organisms associated with endemic fauna and flora, as well as micro-organisms found in extreme habitats in terms of temperature, pressure, toxicity, acidity and salinity (extremophiles), such as Antarctica and hydrothermal vents, below the sea floor and deeper into the subsurface (ibid., paras. 179-180), as well as in brine pools (A/60/63/Add.1, para. 42). Bacteria occupying unique and often extreme habitats in the ocean display adaptations to these environments, which can subsequently be harnessed in biotechnological applications (A/62/66, para. 180). It appears that the main focus of activities with respect to deep sea genetic resources has centred on the microbial communities associated with hydrothermal vents.[75] Other organisms of interest are described in the report of the Secretary-General (ibid., paras. 169-178).

2. Geography of the sampling effort

194. Only a fraction of the oceans have been explored and sampled to date, with the consequence that information on the geography of the sampling effort[76] is limited and only available for specific features, such as seamounts, hydrothermal vents and features associated with ridge systems.

195. Relatively few seamounts have been studied to date. Available information indicates that only about 350 have been sampled, and less than 100 in any detail, out of an estimated 30,000 to 100,000, depending on the definition of seamounts.[77] A majority of the sampled seamounts are located in the Central, North-West and North-East Pacific, followed by the North-East and Central Atlantic.[78] Approximately half of the sampled seamounts included in the database of Seamounts Online[79] appear to be located beyond areas of national jurisdiction.

196. Hydrothermal vents are known to occur along all active mid-ocean ridges and back-arc spreading centres. Approximately one third of the known hydrothermal vents are estimated to be located beyond areas of national jurisdiction,[80] a majority of which are found in the Pacific Ocean, followed by the Atlantic Ocean. Cold seeps occur along active and passive continental margins. Only a small fraction, approximately 65,000 km, of the global ridge system and of the vast continental margin regions have been explored and their communities described. The eastern Pacific ridges have been the most heavily surveyed to date.

197. The International Seabed Authority Geographic Information System displays resource data from the Central Data Repository. It includes information on deep sea

[75] See, for example, An Update on Marine Genetic Resources: Scientific Research, Commercial Uses and a Database on Marine Bioprospecting (UNU Institute of Advanced Studies, 2007).

[76] The term "sampling" in the present section does not differentiate between sampling for commercial purposes and sampling for other purposes.

[77] CenSeam: a Global Census of Marine Life on Seamounts, at http://censeam.niwa.co.nz/.

[78] SeamountsOnline: an online information system for seamount biology, Version 2005-1, available from http://seamounts.sdsc.edu/. The database holds over 12,000 records from 231 sampled seamounts.

[79] SeamountsOnline is a United States National Science Foundation-funded project designed to gather information on species found in seamount habitats and to provide a freely available online resource for accessing and downloading these data.

[80] See the information contained in the International Seabed Authority Central Data Repository, available from http://www.cdr.isa.org.jm/.

biological samples from the Pacific Ocean, most of which seem to have been carried out beyond areas of national jurisdiction (see http://www.test.isa.org.jm/client/html/viewer.html). The first version of ChEssBase, the database of the Census of Marine Life programme on the biogeography of deep water chemosynthetic ecosystems, includes data on 963 species sampled from 96 deep water chemosynthetic sites around the globe.[81] Four areas with combined deep sea ecosystems are targeted for further research by the programme, most of which are located within national jurisdiction.[82]

198. With regard to the pelagic zone, microbial samples were collected as part of the *Sorcerer II* Global Ocean Sampling expedition, which took place between August 2003 and May 2004, a metagenomic study designed to address questions related to genetic and biochemical microbial diversity in the oceans. Most specimens were collected from surface water marine environments. Forty-four samples were obtained from the North-West Atlantic and the Eastern Tropical Pacific. Two of these samples were from areas beyond national jurisdiction, in the Equatorial Pacific Tropical Atmosphere Ocean Buoy and 200 miles from French Polynesia.[83] An inventory of microbial diversity in marine environments is still far from complete and will require, at the very least, several decades to improve (see A/62/66, para. 135). The need for further training and expertise in taxonomy is crucial in this regard (see paras. 208 and 246 below).

199. A number of research activities have been undertaken in order to better assess the distribution of marine taxa, including micro-organisms, and ecosystems, including an expert workshop on biogeographic classification systems in open ocean and deep-seabed areas beyond national jurisdiction (see para. 167 above) and the Hotspot Ecosystem Research on the Margins of the European Seas project (see A/62/66, paras. 146-149; see also para. 94 above).

200. It is important to note that information on research/sample efforts comes from numerous disparate sources and there is currently insufficient metadata to establish a full lineage of the data. Where coordinates are identified, they may be approximate locations, rounded values or rough estimates. A major review process of existing scientific literature would be necessary to ascertain exact information to confidently plot all of the available data against known maritime boundaries in order to get a better understanding and accurate reflection of the distribution of deep sea features, their associated biological communities and the level of the sampling effort beyond areas of national jurisdiction.

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[81] Ramirez-Llodra, E., Blanco, M. and Arcas, A., 2004. ChEssBase: an online information system on biodiversity and biogeography of deep-sea chemosynthetic ecosystems, Version 1, available from http://www.noc.soton.ac.uk/chess/database/database.html.

[82] These include: the Equatorial Atlantic Belt region; the South-East Pacific region; the New Zealand region; and the Arctic and Antarctic regions where research projects are being developed within the International Polar Year Initiative. ChEss is also targeting specific areas as follows: the ice-covered Gakkel Ridge; the (ultra)-slow ridges of the Norwegian-Greenland Sea; the northern Mid-Atlantic Ridge between the Iceland and Azores hot-spots; the Brazilian continental margin; the East Scotia Ridge and Bransfield Strait; the South-West Indian Ridge; and the Central Indian Ridge. See http://www.noc.soton.ac.uk/chess/field.php.

[83] D. B. Rusch1, A. L. Halpern, and others, "*The Sorcerer II* Global Ocean Sampling Expedition: Northwest Atlantic through Eastern Tropical Pacific" in *PLoS Biology*, vol. 5, No. 3 (March 2007).

3. Nature of the interest in marine genetic resources

201. There are a number of interests of a different nature in marine genetic resources from the open ocean and the deep sea, both within and beyond areas of national jurisdiction. These include a scientific interest for the purposes of furthering our understanding of the ecology, biology and physiology of marine species and organisms and the ecosystems of which they are part, and a biotechnology interest for the purposes of developing novel products and processes for application in a range of sectors from health care to environmental clean-up, to nutrition and other industries. The report of the Secretary-General (A/62/66, paras. 157-178) outlines some of the services provided by marine genetic resources, both within and beyond areas of national jurisdiction, thereby providing an indication of the corresponding interest in these resources. The Secretariat of the Convention on Biological Diversity has posted on its website preliminary information related to research on deep seabed genetic resources (http://www.biodiv.org/programmes/areas/marine/research.shtml) and UNU is developing a web-based database of bioprospecting in the Antarctic, Pacific Island countries and the deep sea, and is also examining the nature and extent of scientific and commercial interest in Arctic genetic resources.[84]

202. There appears to be no evidence, however, that any commercial entity has mounted its own dive to the deep sea to collect samples for the purposes of research and development. Commercial interest in sample extraction from the deep sea would be limited to funding research dives by national scientific research organizations or academic institutions and/or collaboration in laboratory research. Biotechnology companies would also rely on samples deposited in national culture collections.[75]

203. To date, research and product development related to marine genetic resources has centred mainly on the development of novel enzymes for use in a range of industrial and manufacturing processes, including chemical and industrial processes involving high temperatures. A number of commercially viable enzymes have been developed from hydrothermal vent microbes. DNA polymerases, some of which have been isolated from several hydrothermal vent species, are also of interest for use in life sciences research, diagnostics, pharmaceutical and therapeutic applications. Microbial exopolysaccharides isolated from hydrothermal vents are under evaluation for therapeutic uses, principally in the areas of tissue regeneration and cardiovascular diseases. Research on hydrothermal vent microbes has also led to the development of ingredients for cosmetics, including anti-ageing creams. Research also suggests that heat-loving microbes from hydrothermal vents may be suitable for use in novel biotechnological processes including oil, coal and waste-gas desulphurization, as well as in the treatment of industrial effluents and the development of new mining techniques such as biomining and bioleaching.[70,75]

204. Patent applications provide a good indication of the types of interests in marine genetic resources. Based on a search of 135 patents, a report by UNU indicates that the chemistry and pharmacology sectors have the highest number of patents filed in relation to marine genetic resources in the period 1973 to date,[75] indicating a strong interest from those sectors. It has also been observed that medical innovation continues to drive the growth of the biotechnology industry in

[84] Contribution of UNU to the present report.

general.[85] However, the contribution of marine genetic resources beyond areas of national jurisdiction to such growth is not clear.

B. Technological issues

205. Technological requirements related to marine genetic resources beyond areas of national jurisdiction include requirements for accessing the resources and for conserving, analysing and exploiting the resources. The 2005 report of the Secretary-General (A/60/63/Add.1, paras. 58-75, 77-82 and 91) provides information on the equipment and infrastructure required to carry out research in the deep ocean, sample and conserve organisms of interest, as well as to analyse them.[86]

206. The capacity of research vessels to reach increasingly deeper ecosystems and resist extreme conditions of temperature and pressure is constantly being improved, as are methods of conservation and analysis. Difficulties of access to marine genetic resources beyond areas of national jurisdiction, in particular those at profound depths, can be circumvented by access to gene banks and culture collections. However, for the resources to maintain the characteristics which make them interesting in such collections, adequate facilities must be provided and maintained. Generally, a number of factors threaten the viability and completeness of the samples stored in gene banks and culture collection and, to date, no conservation technology exists that can fully prevent mutation of genes over time.[87] The further development of bioinformatics and genomic libraries is therefore necessary.

207. From a supply perspective, it must also be noted that technologies such as recombinant technology, which sought to address supply issues by combining the genetic material of different organisms, have had limited success according to some experts.[88] In addition, since culture in laboratory is still a problem for some organisms, technologies are needed to foster sustainability and prevent over-harvesting of natural resources. In this regard, biosynthesis and aquaculture are among the technologies contemplated (A/62/169, para. 86).

208. A key technological requirement for the exploitation of the information encoded in genetic resources is the ability to, inter alia, screen the samples for bioactive compounds, isolate specific metabolites, elucidate their structural composition, and replicate the compounds of interest. Such requirements are greater in the case of marine organisms sampled from extreme environments, which require not only highly technical equipment for sampling and collection but also for conservation and analysis of the samples to ensure that they retain their original properties (see A/60/63/Add.1). It should also be noted that while molecular technology may be the way for the future, an effort is still required to develop additional taxonomic expertise for an adequate classification and identification of

[85] *Beyond Borders: Global Biotechnology Report 2007*, Ernst & Young.

[86] See also http://www.marinebiotech.org/tools.html.

[87] O. H. Frankel, "Genetic conservation in perspective", in O. H. Frankel and E. Bennett (eds.), *Genetic Resources in Plants*, 1970, Oxford: distributed by Blackwell Scientific; *The Conservation of Plant Biodiversity*, O. H. Frankel, A. H. D. Brown, and others (eds.), 1995, Cambridge University Press.

[88] "Commercialization: not plain sailing", presentation by Geoff Burton at the eighth meeting of the Consultative Process, available from http://www.un.org/depts/los/consultative_process/consultative_process.htm.

marine organisms. Marine microbiology also remains underdeveloped because fundamental methods in this area are still lacking (see A/62/66, para. 135).

C. Economic and socio-economic issues

1. Economic valuation of the services provided by marine genetic resources

209. Assessing the actual or potential total economic[89] value of marine genetic resources beyond areas of national jurisdiction can assist decision-making by providing indications of the expected economic and societal benefits of such resources, as well as providing supporting arguments for the possible need for conservation and sustainable use measures.

210. Ecosystem or biodiversity valuation does not entail measuring the economic value of biodiversity as such.[90] Instead, valuation focuses on the economic values of the range of services generated by biodiversity, including their resources and/or functions. Some of the known services, including supporting, regulating and provisioning, provided by marine genetic resources are outlined in the report of the Secretary-General (A/62/66, paras. 157-168). Calculating the total economic value of the services provided by ecosystems, which includes direct use value, indirect use value, option value, bequest value and other non-use value of the services (A/60/63/Add.1, para. 102), is a difficult task. This is particularly true with regard to marine genetic resources beyond areas of national jurisdiction because those areas have been scarcely explored and studied.

211. Various valuation methods are available, some of which are more relevant than others when considering the valuation of marine genetic resources beyond areas of national jurisdiction. For example, the "benefits transfer" technique, which consists of using estimates obtained in one context to estimate values in a different context, can provide an indicative value of the provisioning services of marine genetic resources beyond areas of national jurisdiction. This includes considering the global sales and revenues of biotechnology products which make use of marine-sourced organisms, as well as the level of employment in the marine biotechnology sector, among others.

212. In 2006, the global public biotechnology sector generated over $73 billion in revenues and spent nearly $28 billion on research and development. The biotechnology industry grew by 14 per cent in 2006. Many biotechnology companies are now entering late-stage clinical trials and therefore anticipate a wave of product approvals in the next two years.[91] This is also likely to apply to marine-derived biotechnology products, a few of which are nearing completion of various human clinical trials.[91] 2003 estimates put the global sales of marine biotechnology products at about $2.4 billion for 2002 and expected that number to reach $3.2

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[89] The term "economic" is used in a broad sense since individuals may assign value for different reasons other than the immediate benefits of commercial exploitation of resources.

[90] Secretariat of the Convention on Biological Diversity, *An Exploration of Tools and Methodologies for Valuation of Biodiversity and Biodiversity Resources and Functions*, Technical Series no. 28, Montreal, Canada, 2007.

[91] The site marinebiotech.org includes a "drugs from the sea" index, available from http://www.marinebiotech.org/dfsindex.html, which contains information on marine-derived products, including clinical and commercial development status.

billion in 2007.[92] A report by UNU provides estimates of a number of global market values of industries using marine genetic resources, as well as approximate annual sales values of selected marine-based products.[75] As noted above, a number of commercially viable enzymes have been developed from hydrothermal vent microbes, sourced either within or beyond areas of national jurisdiction, and a few are on the market.[93]

213. In spite of those seemingly high figures, it must be noted that the costs of development and commercialization of products from marine organisms are high, with estimates of $800 million for drug development,[94] and the chances for success low since it can take between 15 to 20 years to complete all the steps that will ultimately lead to the commercialization of a product. Only 0.001 per cent of candidate products actually become clinically approved and produced.[95]

214. Marine genetic resources, including from areas beyond national jurisdiction, also provide a source of livelihood through employment in both public research institutions and private companies. Quantifying the exact level of employment is, however, difficult owing to lack of aggregated and publicly available data, as well as to the fact that such institutions usually also carry out other types of research. By means of comparison, biotechnology is expected to remain an engine of employment since, in 2006, the global biotechnology industry, composed of 4,275 global biotechnology companies, 710 of which were public, employed 190,500 people, increased by 10 per cent compared to 2005.[85] 2004 estimates put at 14 the number of biotechnology and other companies actively involved in product development and/or collaboration with research institutions in relation to thermophiles and hyperthermophiles from hydrothermal vents. These companies were predominately North American and European. At the time, six of these companies had marketed products derived from hydrothermal vent thermophiles and hyperthermophiles sourced both within and beyond areas of national jurisdiction.[75]

215. The "change in productivity" technique is another method of valuation, which consists of tracing changes through chains of causality so that the impact of changes in the condition of an ecosystem can be related to various measures of human well-being. In light of the role of marine genetic resources in the development of novel drugs to treat previously incurable diseases, such as cancer and HIV/AIDS, an estimate of the current global costs of treatment of patients with those diseases could provide an indication of the cost-saving extent of new drugs based on marine genetic resources, including from areas beyond national jurisdiction. Other services provided by marine genetic resources, such as the regulation of climate and oxygen

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[92] *Biomaterials from Marine Sources*, Business Communications Company, Inc., 2003. The report is the latest comprehensive analysis of the marine biotechnology sector.

[93] For example, the company Kiehl's sells several cosmetics based on Abyssine 657 (Alteromonas Ferment Extract), a product based on a naturally derived survival molecule found at hydrothermal vents. See http://www.kiehls.com/_us/_en/about/index.aspx?TopicCode=About%5EOur_Products%5EIngredient_Glossary&Ingred=Abyssine_657.

[94] "From marine expeditions to new drugs in oncology", presentation by PharmaMar at the eighth meeting of the Consultative Process, available from http://www.un.org/depts/los/consultative_process/consultative_process.htm.

[95] "Marine genetic resources: experiences in commercialization", presentation by Marc Slattery at the eighth meeting of the Consultative Process, available from http://www.un.org/depts/los/consultative_process/consultative_process.htm.

provision, are not taken into account by markets but should nevertheless also be taken into account in decision-making.

216. Services with an unquantifiable monetary value also include, for example, the expansion of our knowledge related to marine ecosystems, in particular deep sea ecosystems, and innovation in the pharmaceutical and other sectors, including biotechnology. These advances in knowledge and various sectors contributing to the improvement of human well-being depend on a continuing inflow of updated and quality information encoded by genes and small organic molecules. Updated information is valuable because it provides a basis for the acquisition of new knowledge, which in turn becomes the basis for further advances in research and technology. By exchanging the information, it is consumed, verified, completed, and interlinked with other information. It is this complex process of exchange and quality management that makes the information valuable to the users.[96] While putting a monetary figure on this value is difficult, it should nevertheless not be ignored in decision-making.

2. Level of interest in marine genetic resources

217. As noted above, there is a growing commercial interest in micro-organisms from hydrothermal vents and, more generally, in extremophiles from other sources. However, quantifying the level of the interest in marine genetic resources from areas beyond national jurisdiction is difficult owing to scattered and limited quantified information specifically related to those resources. Some information is also not publicly available owing to its commercially sensitive nature. Any quantification therefore remains anecdotal, speculative and is based on analogies with the biotechnology sector. Strengthening the information base with specific data related to those interests is therefore important. A number of indicators, some of which are outlined below, can nevertheless be used to estimate the level of those interests.

218. For example, the steady increase in the number of scientific publications and patents on marine genetic resources, in particular from the deep sea, demonstrates that this area is of growing importance to both the scientific community and those involved in research and development.[75]

219. As far as patent activity in general is concerned, a report concluded that, between 2005 and 2006, there had been a smaller number of stronger filings for patents in the field of biotechnology, which were filed more widely across the globe.[97] While France, Germany, Japan, the United Kingdom of Great Britain and Northern Ireland and the United States of America accounted for the largest share of global biotechnology patents in 2006, China and India ranked first in terms of growth in biotechnology patent applications.[85] Approximately 10 per cent of 135 patents related to marine genetic resources analysed by UNU had a "CN" publication number, indicating a patent issued in China, and were also held by Chinese nationals.[98]

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[96] S. Jungcurt, Institutional Interplay in Global Environmental Governance: Policy Interdependence, Strategic Interaction and Institutional Learning in the Regime Complex on Plant Genetic Resources for Food and Agriculture, Shaker, Aachen, 2007.

[97] *Biotechnology Report 2007*, Marks & Clerk.

[98] UNU Institute of Advanced Studies, 2007, op. cit., note 75, annex I.

220. It is difficult to quantify with precision the number of patents issued in respect of inventions based on marine genetic resources from areas beyond national jurisdiction as a result of several factors, including: the content and geographic coverage of databases; the accuracy of the search algorithm; and the current configuration of the patent classification system, which, among others, does not lend itself to a search by provenance of the organisms. A UNEP report estimates that at least 37 patents have been issued for products based on deep sea organisms.[99] This, however, does not provide any indication of how many were related to resources found beyond areas of national jurisdiction since both areas within and beyond national jurisdiction include deep sea features.

221. Interestingly, patent filing from academia in the biotechnology sector outpaced the commercial sector by 51 per cent between 2002 and 2006, in a comparison of the top 20 patent filers. Only one corporation ranked among the top five patent assignees overall, which were headed by the Japan Agency for Marine-Earth Science and Technology.[97]

222. Such trends in the global biotechnology sector are likely to be increasingly reflected in relation to marine biotechnology, including with regard to marine genetic resources from areas beyond national jurisdiction. However, there may be a need to manage the legal risk by providing legal certainty for the collection of samples, as highlighted at the Consultative Process, in respect of both public research institutions and the commercial sector.[79,88]

D. Environmental issues

223. While marine genetic resources are information resources, which can be infinitely replicated through laboratory culture, this should not overshadow their physical nature as biological resources vulnerable to a number of stresses. The present section provides an overview of the vulnerabilities of marine genetic resources as a physical resource and of the ecosystems of which they are part, as well as incentives for the sustainable use and conservation of those resources and ecosystems.

1. Vulnerabilities of marine genetic resources and their surrounding ecosystems

224. *Vulnerability of marine genetic resources*. Knowledge about the distribution, function, vulnerability and resilience of marine genetic resources in areas of the open oceans, the deep sea, and the seabed are still largely unknown. The extent and nature of the impacts of various stresses on marine genetic resources can thus only be assumed since evidence is still limited (A/62/169, paras. 83-85 and 87). In addition to the potential impacts of ocean acidification and research related to marine genetic resources (A/62/66, paras. 183-187), concern has been expressed regarding pollution, climate change and overexploitation (A/62/169, paras. 82-88). Other anthropogenic impacts are outlined in chapter II above and in addendum 1 to the 2005 report of the Secretary-General (A/60/63/Add.1, paras. 128-175). Marine genetic resources are also under pressure from natural geophysical processes, such as volcanic eruptions.[74]

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[99] UNEP *Regional Seas Report and Studies*, No. 178, Ecosystems and Biodiversity in Deep Waters and High Seas (UNEP/IUCN, Switzerland, 2006).

225. The impacts of climate change on macro-organisms, in particular fish and corals, have been well documented.[100] However, in the case of micro-organisms such impacts are only assumed to occur (A/62/169, para. 87). With regard to concerns regarding overexploitation, it can be noted that markets that treat resources as "free resources" that can be accessed and used by anyone can lead to exploitation to the point where no further surplus value can be derived from these resources (A/60/63/Add.1, paras. 98 and 99). The theory, which is relevant to the "container" of the genetic information since it can be physically captured, also is relevant to genetic resources as long as technological impediments prevent laboratory culture and synthesis of organisms of interest, thereby requiring further in situ collection. This, by and large, is still the case (A/62/66, para. 156). Prior environmental impact assessments are therefore very important when laboratory cultivation is not possible and in situ collection is necessary.

226. While some ecosystems and organisms are extremely dynamic and can reproduce in a very short period of time, other ecosystems are less dynamic and their organisms slow growing. In the latter case, risks of genetic erosion, that is the loss of genetic diversity within a species, a potential consequence of the above stresses, are an aspect to consider. There is a delicate interdependence between genetic diversity and species diversity. Extinction of species as a result of the cumulative impacts of various anthropogenic stresses and natural events is likely to result in changes in genetic diversity and genetic erosion.[101] Some loss of genetic diversity is expected under natural conditions as a result of natural selection and processes. However, these losses are usually not catastrophic, are often balanced by mutation and gene flow, and typically do not occur in concert across the entire species. Overall, genetic erosion can have cascading effects throughout an ecosystem.[101] It is therefore important to ensure that human activities do not increase the likelihood of genetic erosion through cumulative impacts with natural processes.

227. *Vulnerability of surrounding ecosystems*. The impacts of research activities related to marine genetic resources on surrounding ecosystems largely depend on where the sampling or collection occurs. In this regard, while collection of micro-organisms from the water column may have limited impacts, collection in vulnerable seabed habitats may potentially be damaging. Such impacts also depend on the sampling and collection methods and frequency. To date, no comprehensive assessment of the impacts of marine scientific research has been undertaken. However, several initiatives, including the development of codes of conduct, have been undertaken within the scientific community to ensure responsible research in specific ecosystems, such as hydrothermal vents.[74] These initiatives, at present, are voluntary and left to the initiative of the scientific community, depending on the

[100] Climate Change and Biodiversity, IPCC Technical Paper V (Intergovernmental Panel on Climate Change, 2002); Interlinkages between biological diversity and climate change. Advice on the integration of biodiversity considerations into the implementation of the United Nations Framework Convention on Climate Change and its Kyoto protocol, CBD Technical Series No. 10 (Secretariat of the Convention on Biological Diversity, 2003); The Future Oceans — Warming Up, Rising High, Turning Sour: special report (German Advisory Council on Global Change, Berlin, 2006).

[101] "What is genetic erosion and how it can be managed?" in *Why we care about genetics*, Vol. 11, Genetic Resources Conservation Program, University of California, 2006.

level of interest and concern (see also paras. 56, 273-274 and 277 of the present report).

2. Incentives for the conservation and sustainable use of marine genetic resources

228. The sustainable provision of genetic information, which is a driver of innovation and biodiscovery, is directly dependent on the conservation and sustainable use of biological resources and their diversity, including the ecosystems in which these resources can evolve under dynamic conditions.[96] Incentives for their conservation and sustainable use are therefore necessary. Key aspects relating to incentives for the conservation and sustainable use of genetic resources beyond areas of national jurisdiction are their character as both a physical and informational resource. From a physical point of view, conservation and sustainable use of marine genetic resources should aim to maintain genetic diversity and, to the extent possible, reduce cumulative impacts from human activities on such diversity. From the point of view of increasing the level of available information, conservation and sustainable use of marine genetic resources should aim to maintain an updated flow of genetic information, including by encouraging research.

229. In paragraphs 110 to 118 of addendum 1 to the 2005 report of the Secretary-General (A/60/63/Add.1), information is presented on various economic tools for the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction. Positive incentives include monetary and non-monetary incentives, such as community recognition, the creation of markets and participation in management.[102] Economic and market incentives are sometimes considered most effective when economic benefits are a driving force. Some experts believe that replacing the market concept of "free resources" with a form of property rights could also stimulate the protection of ecosystems. The allocation of property rights, in particular intellectual property rights, is also considered by some as a means to stimulate research, by awarding exclusive rights for a limited period of time, as well as sharing of information and knowledge by the requirement for publication of the invention in patent applications (ibid., paras. 115-118) (see also paras. 235-242 below).

230. Instruments which promote self-regulation have also been considered useful by some States, in particular beyond areas of national jurisdiction where enforcement of protection measures is difficult (see paras. 56, 273-274 and 277 of the present report).

231. In order to identify appropriate incentives for the conservation and sustainable use of marine genetic resources and their ecosystems beyond areas of national jurisdiction, ascertaining the primary drivers, such as commercial or other, of research on such resources is, however, necessary.

[102] "Incentive measures: an analysis of existing and new instruments that provide positive incentives", Note by the Executive Secretary (UNEP/CBD/SBSTTA/11/INF/11), available at www.cbd.int.

E. Legal issues

232. The dual character of marine genetic resources as tangible and information resources, requires the application of measures for their conservation and sustainable use as well as for the flow and management of the information they embody. In this regard, a number of instruments are relevant to marine genetic resources beyond areas of national jurisdiction and are described in previous reports of the Secretary-General (A/60/63/Add.1, paras. 176-225; and A/62/66, paras. 188-233).

233. With regard to the utilization of genetic resources and the conservation and sustainable use of marine biodiversity, it should be recalled that UNCLOS sets out the legal framework within which all activities in the oceans and seas must be carried out. Different views have been expressed on the provisions of UNCLOS applicable to marine genetic resources beyond areas of national jurisdiction (see paras. 275-277 below; see also A/62/169, paras. 71-75). In addition, while the Convention on Biological Diversity does not apply to biological components beyond the limits of national jurisdiction, it applies to processes and activities carried out under the jurisdiction or control of States in those areas and requires its parties to cooperate directly, or through competent international organizations, in respect of areas beyond national jurisdiction, for the conservation and sustainable use of biological diversity (see also para. 128 above).

234. The regulations adopted by International Seabed Authority in order to regulate the environmental impacts of prospecting and exploration activities on the environment of the Area also have a role (see paras. 50, 157 and 184 above). In addition, several other instruments which are relevant to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction, including CITES, are also pertinent to the issue of marine genetic resources.

235. When considering the need for information flow and management, a number of instruments related to the protection of intellectual property are relevant, including the Patent Cooperation Treaty and the Agreement on Trade-Related Aspects of Intellectual Property Rights of the World Trade Organization (A/60/63/Add.1, paras. 222-225; and A/62/66, paras. 219-228). Recent discussions have focused on the relationship between intellectual property rights and marine genetic resources and this section, therefore, puts particular emphasis on this issue.

236. There are different points of view regarding the benefits of intellectual property rights. Advocates of stringent intellectual property rights have argued that they encourage technology transfer, stimulate innovation and bring collateral benefits by, inter alia, strengthening the investment climate. Intellectual property rights would also have a role in promoting information sharing, for example, through the requirement to describe the invention in patent applications. However, economists have had difficulties in measuring the costs and benefits of intellectual property rights, particularly at different stages of development.[103]

237. Intellectual property is divided into industrial property, which includes patents, trademarks, industrial designs, and geographic indications of source, and

[103] United Nations Conference on Trade and Development, *The Least Developed Countries Report 2007*.

copyright.[104] Some of these tools are more relevant than others in relation to genetic resources. While patents are most frequently used to protect inventions based on genetic resources, trademarks have also been used.[105]

238. The patent system does not grant ownership but rather the exclusive use by the patent holder of the naturally occurring material or the products and processes derived thereof for a limited period of time. Regardless of where the original genetic resource is sourced, patents are granted pursuant to domestic law and, as a result, the extent of patentability and the rights of a patent holder are determined by the domestic law of the State in which the patent is sought, subject to relevant international instruments.

239. The relationship between the patent system and genetic resources has been discussed in several international forums in recent years, including the Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore of the World Intellectual Property Organization (WIPO) and the Convention on Biological Diversity. Issues raised in relation to the relationship between genetic resources and patents include: whether naturally occurring organisms and associated small organic molecules isolated from their natural surroundings are inventions or discoveries; whether they meet the criteria of being capable of industrial application; whether both products and derivatives are subject to patent protection; whether the extension of patent protection to genetic material is justifiable on ethical grounds; and whether there are obligations for a patent applicant or patent holder to share the benefits from the exploitation of the resources and the patent itself (A/60/63/Add.1, para. 216).[106] It must be noted that the role of traditional knowledge is limited with regard to marine genetic resources from areas beyond national jurisdiction, owing to their great distance from shallow waters and remote accessibility to traditional means.

240. Issues related to endemism and lack thereof should also be born in mind. While it has been observed that the closer the geographic distance, the closer the genetic distance, organisms found in different areas of the oceans, either within or beyond areas of national jurisdiction, may have similar genotypes.[71] For example, one study has shown that microbial community composition within two hydrothermal sites at separate locations was highly similar, as 92 per cent of the genes encoding small subunit ribosomal DNA were the same in sequence.[70] While

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[104] Patents are exclusive rights granted for an invention, whether a product or a process. Trademarks provide protection to the owner of a mark by ensuring the exclusive right to use it to identify goods or services, or to authorize others to use it in return for payment. Geographical indications are signs used on products that have a specific geographical origin and possess qualities or a reputation that are due to that place of origin. See *Understanding Intellectual Property*, WIPO Publication No. 895 (E). Unlike protection of inventions, copyright law only protects the expression of ideas, such as literary works, databases and technical drawings, not the ideas themselves. See *Understanding Copyright and Related Rights*, WIPO Publication No. 909 (E).

[105] For example, New England Biolabs owns the trademark "Vent™" and "Deep Vent™" related to DNA polymerase products. Stratagene Inc. holds the trademark for a derivative of a hydrothermal vent species *Pyroccocus furiosus* marketed as "ArchaeMaxx™".

[106] See "Draft issues paper prepared by the World Intellectual Property Organization", circulated at the eighth meeting of the Consultative Process.

species endemism may be high, reaching 100 per cent in some hydrothermal vents,[107] genetic endemism may be lower and a similar or identical genotype may be found at great geographic distance and possibly both within and beyond areas of national jurisdiction. In this regard, the implications of patenting inventions based on marine genetic resources that can be found both within and beyond areas of national jurisdiction should also be considered, as well as issues related to disclosure of source or origin requirements.[106]

241. In light of the provisions of UNCLOS related to marine scientific research (as outlined in A/60/63/Add.1, paras. 204-207; and A/62/66, paras. 203, 208 and 215-216), the following questions may arise and require further consideration: whether filing a patent application is considered as a claim to part of the marine environment or its resources; whether the rights conferred by a patent are likely to interfere with the right to carry out marine scientific research; and whether the degree of confidentiality required prior to the filing for patents in order to safeguard the novel character of an invention is compatible with the requirement for dissemination and publication of data and research results.

242. In light of the issues associated with patents related to genetic resources, the role of the exceptions offered by the patent system, such as experimental use exemptions, which allow scientists to use a patented invention provided that the research is for non-commercial purposes, could be further analysed.[108] The role of other intellectual property tools, including geographical indications and trademarks, as well as of open-source licensing,[109] could also be further considered.

F. Capacity-building and transfer of technology

243. The need for capacity-building and transfer of technology was emphasized both at the first meeting of the Working Group (see A/61/65, paras. 29 and 68-70) and at the eighth meeting of the Consultative Process (see A/62/169, paras. 99-108). Greater international cooperation in these areas, in accordance with the relevant provisions of UNCLOS, was advocated (see also para. 112 above).

244. A 1993 assessment by the World Bank estimated that research institutes in the fields of marine biology and marine biotechnology-related areas were scattered throughout the developing world but that their capabilities varied widely. While many had the capability to perform rudimentary experiments in marine biology, only

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[107] T. Wolff, "Composition and endemism of the deep sea hydrothermal vent fauna", in *Cahiers de Biologie Marine*, 2005, vol. 46.

[108] Research Use of Patented Knowledge: A Review (OECD Directorate for Science, Technology and Industry Working Paper 2006/2), available at www.oecd.org/. A report by the Biotechnology Industry Organization found that patenting had not negatively impacted the biotechnology industry. See T. Buckley, *The Myth of the Anticommons* (Biotechnology Industry Organization, 2007).

[109] Open-source licensing is based on the principle of voluntary contributions of innovators towards the resolution of a common problem and sharing through an open licensing system that ensures ready use of the protected technologies. To retain legal access to these technologies, an open source license holder undertakes not to prevent other licensees from using the technology and agrees to share access to the central technology, while using it to create improvements and derivative applications. Open-source licensing in relation to biological resources has been developed in the field of agriculture. See the Biological Open Source at http://www.bios.net/daisy/bios/licenses/398.html.

a few could take on complex projects.[110] While marine biotechnology is a sector undergoing rapid expansion and several developing countries are in the process of developing advanced technological capabilities,[111] this assessment may still be valid since the report also notes that the capability required for research and development involving advanced biotechnologies is on an order of one or two magnitudes more demanding in terms of expertise and equipment than are classical investigations in biology and bioscience. It also appears that most developing countries lack the infrastructure and funding to perform the necessary activities to ensure continued viability of their gene bank collections (see also paras. 206 and 208 above).

245. In order for developing countries to develop the necessary capacity and technology to benefit fully from marine genetic resources, including those from areas beyond national jurisdiction, access to the knowledge pool and the ability to learn, master and adapt relevant technologies is required. This process includes transfer of technology through a number of different means, including formal (e.g., licensing, foreign direct investment) or informal (e.g., movement of people) and/or market (e.g., interaction with upstream suppliers or downstream customers) or non-market (e.g., technical assistance programmes of official development agencies or non-governmental organizations) means. A report by the United Nations Conference on Trade and Development (UNCTAD) notes that the importance of the different means of transfer of technology varies according to different stages of development, as do developing countries' ability to take advantage of them.[103] The level and extent of present capacity-building activities and transfer of technology are difficult to assess.

246. Sharing of research and development results, participation in scientific and research and development programmes, access to databases and ex situ biological inventories on preferential terms, institutional capacity-building, and research directed towards priority needs, such as health and food security, are some examples of capacity-building and transfer of technology. The need to facilitate data and information-sharing in relation to marine genetic resources was highlighted as a critical issue by delegations at the eighth meeting of the Consultative Process. Simplified access to research results, for example, through the establishment of inclusive and open databases of information on marine genetic resources, such as Genbank, could be further enhanced, as could the available tools in the public domain at the global level to access marine biodiversity and genetic resources data. It would also be important to address the need for taxonomic expertise, which supports the integration of biodiversity data and the networking of independent datasets (see 62/169, paras. 38, 39 and 106).

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[110] R. A. Zilinskas and C. Lundin, *Marine Biotechnology and Developing Countries*, World Bank, discussion papers, 210, Washington, D.C., 1993.

[111] For example, a centre of research excellence in genomic and bioinformatics (GeBiX) was recently created in Colombia for research on organisms from extreme environments, see http://eisc.univalle.edu.co/index.php?option=com_content&task=view&id=113; see also the research projects of the Indian National Institute of Oceanography and its list of patents at http://www.nio.org/jsp/indexNew.jsp, and the activities of the Laboratory of Marine Bioactive Substances of the Chinese First Institute of Oceanography at http://www.fio.org.cn./english/index.asp, of the Oceanographic Institute at the University of Sao Paulo at http://www.io.sp.br/, and of the Mexican Department of Oceanography at http://www.semar.gob.mx/oceano.htm. See also: "Argentine activities of bioprospecting and bioremediation in Antarctica", document IP112 presented to the twenty-ninth Meeting of the Antarctic Treaty Consultative Meeting in 2006.

247. The role of international cooperation — and the associated need for cooperative mechanisms — between developing and developed States in enhancing capacity-building and technology transfer was highlighted at the eighth meeting of the Consultative Process. Cooperative programmes among researchers of various countries, such as the Census of Marine Life and the International Cooperative Biodiversity Groups Programme, may have a role in this regard. The capacity-building activities of a number of international organizations, including support from GEF, the UNCTAD Biotrade Initiative and the activities of the ISA, may also have a role (ibid., paras 103-108).

248. In a recent publication, UNU reports on some recent studies that have considered possible options in relation to the sharing of monetary benefits arising out of the utilization of marine genetic resources from areas beyond national jurisdiction.[75] These options include access and licence fees, payment of royalties, research funding, joint ownership of intellectual property rights and fees to be paid to trust funds supporting conservation and sustainable use of marine biodiversity.

VI. The question of whether there is a governance or regulatory gap relating to the conservation and sustainable use of marine biological diversity beyond areas of national jurisdiction, and if so, how it should be addressed

A. Introduction

249. As outlined in this report, the oceans face threats from a wide range of human activities and the marine environment continues to degrade (see chap. II above). It is well recognized that there is a need for effective implementation of binding and non-binding international instruments to respond to these threats.

250. Recent discussions in international forums have raised the question of whether there is a "governance or regulatory gap" in the existing legal framework relating to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction. While this chapter does not consider separately the issue of governance or regulatory gaps, a distinction should be made between "governance" and "regulation". Although definitions and uses of "governance" are varied, governance encompasses the rules of decision-making and institutional arrangements, as well as the decisions themselves.[112] In this context, it is suggested that "regulation" refers to the adoption of binding rules or decisions by a governance body.[113]

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[112] Elke Krahmann, "National, regional, and global governance: one phenomenon or many?", *Global Governance*, vol. 9 (2003); Achim Steiner and others, "Global governance for the environment and the role of multilateral environmental agreements in conservation", *Oryx*, No. 2, Vol. 37, April 2003.

[113] "Regulation" has been defined as a rule or order having legal force, issued by an administrative body, *Black's Law Dictionary* (7th ed.) West Group, St. Paul, 1999. In the context of the law of the sea, it has been suggested that "regulation" and "rule" refer to binding rules or decisions, as opposed to terms such as "standards" that could also include non-binding instruments (see Budislav Vukas, *Law of the Sea: Selected Writings*, Martinus Nijhoff Publishers, Leiden, 2004, pp. 27-28 and 32-34).

251. The question of governance or regulatory gaps is ultimately a question of policy. Since the identification of specific "gaps" in the present report could be perceived as a policy conclusion on the need for additional governance or regulation, this chapter focuses instead on issues or concerns that have been raised in international forums in relation to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction, including proposed ways to address them. Owing to space limitations, the present chapter does not present an exhaustive list of these issues, but reviews those discussed most recently in international forums.

252. *Information gaps*. At the outset, it must be noted that underpinning many of these issues is the issue of gaps in information. For example, in relation to fisheries and the status of stocks, while most straddling fish stocks are generally well studied, knowledge about some of these stocks and many highly migratory fish stocks is uncertain. Information on discrete high seas fish stocks and associated species is also very limited, and additional scientific research is needed to ascertain the status of these stocks to provide a solid basis for the adoption of conservation and management measures.[114]

253. In respect of marine scientific research, the International Seabed Authority recently reported that the current level of knowledge and understanding of deep sea ecology was not yet sufficient to allow conclusive risk assessment of the effects of large-scale commercial seabed mining. In order to manage the impact of mineral development in the Area and prevent serious harm to the marine environment, it was essential to have better knowledge of the state and vulnerability of the marine environment in mineral-bearing provinces. Further, given the costs of scientific research in the deep sea, which was beyond the capacity of many States, the most effective means of gaining better knowledge was to encourage cooperation among States, national scientific institutions and contractors in areas of environmental study and research (see also paras. 110 and 197 above); and ISBA/13/A/2, paras. 59-60, 67).

254. Other information gaps that have been identified include the distribution and vulnerability of marine genetic resources and the impacts of ocean noise (see paras. 51-54, 194, 224-225 and 227 above). In this respect, the General Assembly recently encouraged further studies and consideration of the impacts of ocean noise on marine living resources, and requested the Division to compile the peer-reviewed scientific studies it receives from Member States and make them available on its website (see General Assembly resolutions 61/222, para. 107; see also A/62/66, paras. 286-288).

255. At the first meeting of the Working Group, it was agreed that research played a fundamental role with regard to the conservation and management of marine biodiversity, and that knowledge about marine biodiversity beyond areas of national jurisdiction was insufficient. Several States advocated further scientific studies as a precondition for a meaningful examination of the topic of biodiversity. States generally considered that it was essential to build a stronger scientific basis to facilitate the adoption and implementation of sustainable management and conservation measures for marine resources beyond areas of national jurisdiction.

[114] A/CONF.210/2006/1, para. 328. At present, there is no global inventory of fish stocks, although FAO is developing the Fisheries Global Information System to fulfil this need.

However, some States indicated that enough information was already available for making immediate and necessary policy and management decisions, including on the basis of the precautionary approach (see A/61/65, para. 18).

256. Several States noted that basic information was also often missing with regard to the nature and extent of fishing activities carried out beyond areas of national jurisdiction. Other States noted that existing information was focused on individual sectors and suggested that information should be gathered in a way that allowed scientific comparisons. States also highlighted the need for further studies on the current range and nature of activities associated with the use of deep seabed resources, the nature and significance of the benefits generated, how widely the benefits were shared and whether the benefits supported the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction (ibid., paras. 45 and 47).

B. Legal and institutional framework for the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction

257. The present section provides a brief overview of the existing legal and institutional framework.[115]

258. UNCLOS sets out the legal framework within which all activities in the oceans and seas must be carried out. It was intended to create an enduring normative framework for the regulation of ocean space. In this respect, although UNCLOS does not specifically address issues relating to biodiversity, its jurisdictional framework and general principles apply to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction. This legal framework is supplemented by two implementing agreements, namely the 1995 Fish Stocks Agreement and the Part XI Agreement.

259. UNCLOS was also intended to adapt to emerging needs and requirements. Accordingly, provision was made for UNCLOS to develop over time, including through incorporation by reference of generally accepted international standards (see, for example, art. 94 (5), 119 (1), 201, 207 (1), 211 (2), (5) and (6), 226 and 271) and adoption of compatible regional and global agreements (see, for example, art. 197, 207 (4), 208 (5), 210 (4), 211 (1), 212 (3) and 243). States also act through intergovernmental organizations in order to achieve the objectives of the Convention. As a result, an array of agencies has become concerned, directly and indirectly, with oceans governance issues, including the conservation and sustainable use of marine biodiversity. Particularly relevant in this regard is the work of UNEP, the Convention on Biological Diversity, FAO, IMO, UNESCO/IOC, and the International Seabed Authority and the instruments that have been adopted under their auspices.

260. UNCLOS is thus complemented by a number of specialized instruments, some of which aim at the regulation of certain activities, such as fishing and shipping, while others specifically address the conservation and sustainable use of biodiversity. These instruments directly or indirectly address issues relevant to the

[115] For a summary of the legal framework for the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction, see A/60/63/Add.1, paras. 177-196.

conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction.[116]

261. In addition, a number of other non-binding international instruments have developed general principles and policies providing for the conservation and sustainable use of marine biodiversity, including beyond areas of national jurisdiction, such as the precautionary approach and ecosystem approaches. These instruments include the Rio Declaration on Environment and Development and Agenda 21 of the United Nations Conference on Environment and Development, and the Johannesburg Declaration on Sustainable Development and the Johannesburg Plan of Implementation of the World Summit on Sustainable Development (see A/59/62/Add.1, paras. 238-243).

C. Issues or concerns raised in relation to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction, including ways to address them

262. The present section reviews some of the issues or concerns which have been raised recently in international forums in relation to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction, and ways to address them. As noted above, the section does not present an exhaustive list of these issues.

1. General views on issues or concerns and ways to address them

263. It was generally agreed at the first meeting of the Working Group that a priority should be to improve the level of implementation of existing instruments, including the principles and tools available under these instruments to address the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction, such as the precautionary approach and the ecosystem approach. Effective implementation of existing instruments, whether binding or non-binding, is necessary to enhance the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction (see A/61/65, para. 50). The importance of implementation of existing instruments will be discussed below on a sectoral basis.

264. Different views have been expressed, however, on ways to address the issues posed by the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction. Some States consider that existing instruments provide an adequate legal framework to address these challenges, and existing agreements and mechanisms should be used to the greatest extent possible to achieve optimum conservation and sustainable use under existing sectoral mandates (ibid., para. 57).

265. Other States have expressed the view that improvement in the degree of implementation of existing agreements will be largely sectoral in nature, and therefore should be carried out in conjunction with an effort to improve cooperation and coordination among existing mechanisms, among international organizations, and among sectors and regimes with varying competencies beyond areas of national jurisdiction. It has been suggested that this approach takes into account the cross-

[116] The relationship of the Convention to these instruments is addressed in art. 237 and 311. For a summary of these instruments, see A/60/63/Add.1, paras. 184-196; see also A/59/62/Add.1, part II and A/59/298, part II.

cutting nature of marine biodiversity, as well as the existence of numerous, and often overlapping, legal frameworks and bodies. A greater degree of cooperation among States is also called for, in conformity with the duties of States under the Convention, in relation to the conservation and management of living resources on the high seas and the protection and preservation of the marine environment (ibid., paras. 52-53; see also chap. III of the present report).

266. Other States have argued that integrated management approaches are needed to bring current sectoral authorities and tools together. According to these States, there are no clear mechanisms or policies in place to foster cooperation and coordination for the conservation of vulnerable marine ecosystems. In this context, it has been proposed that an implementing agreement to the Convention should be negotiated to create the necessary legal framework to enhance cooperation for the integrated conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction, including through the establishment of networks of MPAs based on scientific evidence (see paras. 268-270 and chap. IV of the present report). It has been suggested that such an agreement could help to overcome the fragmentation and sectoral nature of the current international regulatory framework, and provide for the possibility of cumulative impact assessments across different sectors (see A/61/65, paras. 54-55).

267. In response, some States have indicated that the adoption of a new legal instrument would not necessarily stop the rate of loss of marine biodiversity. Some States also fundamentally disagree with the need to adopt a new instrument and have raised concerns over the complex and time-consuming nature of the negotiation of new legal instruments, as opposed to improvement in the implementation of existing instruments (ibid., para. 55).

268. *Area-based management*. Chapter IV above addresses the types of area-based management tools, their regulatory framework and implementation issues.

269. A number of States at the first meeting of the Working Group highlighted the need for further implementation of the precautionary and ecosystem approaches, and wider use of environmental management tools, including environmental impact assessments. Some States also raised the need for a process to evaluate the features of ecosystems put at risk, a process to assess the effectiveness of mitigation tools, and objective criteria to identify and establish areas requiring protection, such as MPAs or other area-based management tools. In that respect, the establishment of area-based management measures, including representative networks of MPAs and temporal and spatial closures for fisheries management, was identified by a number of States as a key tool to improve integrated conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction.[117]

270. A number of States also noted that an implementing agreement to UNCLOS could create a new regulatory and governance regime for the establishment and management of multi-purpose MPAs. This new regime would be based on the principles of ecosystem management and precaution, including the use of prior environmental impact assessments and placing the burden of proof for harm on users. However, other States considered that the establishment of high-seas MPAs was only a possible tool for obtaining a multisectoral approach, and indicated that

[117] See A/61/65, paras. 33-35 and 59-60. Recent efforts to develop ecological and biological criteria for the identification of MPAs are presented in paras. 169-171 of the present report.

the establishment of MPAs should focus on the type of marine resource and the type of activity threatening it. These States were of the view that there should be a strong causal link between the impacts being addressed and the management measures proposed, consistent with customary international law, as reflected in UNCLOS (ibid., paras. 61 and 62).

271. *Marine scientific research*. The regime provided by UNCLOS for the conduct of marine scientific research has been considered in previous reports (see A/62/66, paras. 203-218; and A/60/63/Add.1, paras. 190 and 202-208).

272. At the first meeting of the Working Group, different views were expressed regarding marine scientific research beyond areas of national jurisdiction. Some States held the view that marine scientific research relating to marine genetic resources in the deep seabed was regulated by the provisions dealing with marine scientific research in the Area under parts XI and XIII of UNCLOS. Some other States disagreed and stressed the importance of freedom of scientific research and the need to avoid a burdensome regulatory regime (see A/61/65, para. 65).

273. A number of States also raised concerns over the possible impacts of marine scientific research on marine biodiversity. In this respect, it has been suggested that regulatory measures, such as codes of conduct, are needed to ensure that potential impacts are assessed in advance and resources are used in a sustainable manner.[118]

274. Different views have been expressed with regard to the role of codes of conduct. Some States have suggested that codes of conduct should be adopted by marine researchers to regulate their activities. For example, InterRidge has developed a voluntary code of conduct for hydrothermal vent research, which provides a minimum benchmark of expected behaviour among collaborating organizations (see also para. 56 above).[119] Other States have preferred the establishment of internationally agreed codes of conduct, such as an international code of conduct for responsible marine scientific research based on the model of the FAO Code of Conduct (see A/61/65, para. 66).

275. *Marine genetic resources*. This issue has also been the subject of previous reports and recent discussions in international forums (see, in particular, A/59/62, A/59/122, A/60/63/Add.1, A/61/65 and A/62/66, paras. 126-249) and is further addressed in chapter V of the present report.

276. Different views have been expressed on the relevant legal regime on marine genetic resources beyond areas of national jurisdiction, that is, whether they are part of the common heritage of mankind, and fall under the regime for the Area, or are part of the regime for the high seas. Other issues that have been raised in that regard include: the relationship between marine scientific research and bioprospecting,

[118] See A/61/65, para. 27, and A/59/62/Add.1, paras. 232 and 233. See also "Options for Preventing and Mitigating Impacts of Some Activities on Selected Seabed Habitats" to be submitted to the Convention on Biological Diversity Subsidiary Body on Scientific, Technical and Technological Advice-13 in 2008: codes of conduct can be applied as temporary measures in the absence of laws and management plans (usually developed by the industries or sectors concerned), used to enhance the implementation of an existing legal framework, or used as self-regulatory measures; they may support the enforcement of relevant standards, policies and rules or, in some cases, serve as a substitute for them.

[119] A/62/169, paras. 67-70. The Authority has issued a set of recommendations for the guidance of contractors for the assessment of the possible environmental impacts arising from exploration for polymetallic nodules (see ISBA/7/LTC/1/Rev.1 and Corr.1 and A/57/57, para. 415).

legal aspects related to access and benefit-sharing, international cooperation in marine scientific research through the exchange, sharing and dissemination of information, cooperation in technology transfer, and the role of intellectual property rights.

277. Different views have also been expressed on the need for more formal regulation of all marine genetic resources beyond areas of national jurisdiction within a broader, integrated approach to the conservation and sustainable use of marine biodiversity. Some States have taken the view that there is a need for better understanding of this issue before legal, policy and institutional options are developed, and for compliance with existing obligations, in particular in relation to marine scientific research and the protection of the marine environment. The view has also been expressed that these issues could be addressed through the development of guidelines, codes of conduct, and impact assessments (see A/61/65, paras. 29-31 and 71-73; see also A/62/169, paras. 67-81).

2. Participation in existing international instruments

278. A priority, often expressed in international forums, has been to increase the level of participation in existing international instruments related to the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction. In that regard, the General Assembly has repeatedly called on States to become party to UNCLOS, the 1995 Fish Stocks Agreement, and the FAO Compliance Agreement, and it has emphasized the importance of achieving the goal of universal participation in some international instruments. The importance of participation in these instruments was also highlighted in the Johannesburg Plan of Implementation.

279. As of 31 August 2007, there are 155 parties to UNCLOS and thus universal participation in the Convention remains an important goal. Achieving universal participation in UNCLOS will provide greater certainty and stability within the law of the sea, and thus contribute to international peace and security.

280. In the case of fisheries, full participation in international fisheries instruments is a necessary precondition to the reduction of global overfishing. In this regard, the 1995 Fish Stocks Agreement is the most comprehensive agreement relating to the conservation and management of fish stocks. However, its full potential cannot be achieved unless all relevant coastal States, fishing States and flag States are parties to it.[120] Until the Agreement enjoys universal participation and all States fully comply with their obligations to cooperate under international law, including the obligation to comply with the conservation and management measures adopted by RFMO/As, unregulated high seas fishing by non-members will remain a considerable problem.[121]

281. Also important in this regard is the need for States to become party to the constitutive instruments of RFMO/As that manage marine resources in areas where vessels flying their flag conduct fishing operations. It is fundamental to the effectiveness of the 1995 Fish Stocks Agreement that all States with a real interest in

[120] Following the accession by Romania on 16 July 2007, the number of parties to the Agreement rose to 67, including the European Community.

[121] See the statement by the Secretary-General of the International Seabed Authority to the General Assembly at its fifty-ninth session, 17 November 2004 (A/59/PV.56).

a fishery become members of the relevant RFMO, or agree to apply the established conservation and management measures, or otherwise ensure that their vessels are not authorized to access the fisheries resources.

282. Some non-parties to the 1995 Fish Stocks Agreement have identified impediments to the possibility of their becoming parties, including lack of capacity and resources to implement the Agreement, as well as concerns over the possible interpretation and implementation of some provisions (see A/CONF.210/2006/15, annex, para. 52; see also A/CONF.210/2006/1, paras. 314-327). In response, the General Assembly has called upon States to promote, through continuing dialogue and implementation of the assistance and cooperation provided in articles 24 to 26 of the Agreement, further participation in the Agreement by seeking to address, inter alia, the issue of lack of capacity and resources that might stand in the way of developing States becoming parties (see General Assembly resolution 61/105, para. 102).

283. It is also important for States to become party to international instruments relating to pollution from vessels and other instruments aimed at the protection and preservation of the marine environment. In this respect, the General Assembly has encouraged States to ratify or accede to international agreements addressing the safety of navigation, and the protection and preservation of the marine environment and its living marine resources, the introduction of harmful aquatic organisms and pathogens and marine pollution from all sources, and other forms of physical degradation. Particularly important in this regard are the 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (in force);[122] the International Convention on the Control of Harmful Anti-Fouling Systems on Ships, 2001;[123] and the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004[19] (which are yet to enter into force) (see General Assembly resolution 61/222, paras. 50, 75, 76 and 81).

284. In its annual resolutions on oceans and the law of the sea, the General Assembly has, inter alia, called upon donor agencies and international financial institutions to keep their programmes systematically under review to ensure the availability in all States, particularly in developing States, of the economic, legal, navigational, scientific and technical skills necessary for the full implementation of UNCLOS, as well as the sustainable development of the oceans and seas nationally, regionally and globally (ibid., paras. 9 and 11-14; see also paras. 79, 102, 113-115 above).

3. Living resources of the high seas

(a) Fisheries

285. The present section reviews some of the issues relating to the conservation and management of high seas living resources, with attention to the issue of gaps in the level of implementation of existing fisheries instruments and the effectiveness of the existing institutional arrangements, in particular at the regional level.

286. Articles 116 to 119 of UNCLOS provide for the general duty to cooperate in the conservation and management of all living resources of the high seas, including discrete high seas fish stocks. These obligations are supplemented by other binding and

[122] IMO/LC.2/Circ.380.

[123] International Maritime Organization, document AFS/CONF./6, annex.

non-binding international instruments, such as the FAO Compliance Agreement and the FAO Code of Conduct. A number of provisions in the 1995 Fish Stocks Agreement, including provisions on the application of the precautionary approach and an ecosystem approach, also apply to the conservation and management of all marine capture fisheries (see A/CONF.210/2006/15, annex, para. 2; General Assembly resolution 60/31, para. 12; and A/CONF.210/2006/1, para. 4).

287. A number of challenges remain in achieving full implementation of the 1995 Fish Stocks Agreement. There has been some progress in addressing overcapacity at the national and regional levels, but the current level of fishing capacity in many fisheries is still high, and implementation of relevant instruments is far from complete. Ensuring timely and accurate data reporting, including reporting of catches, also remains a serious challenge.[124]

288. With respect to developing States, it is necessary to enhance assistance to developing States parties to enable them to effectively implement the 1995 Fish Stocks Agreement, as well as to build their capacity. In this respect, an assistance fund was established pursuant to part VII of the Agreement to provide those States parties with financial assistance in implementing the Agreement. Other means also exist to assist developing States in the management of straddling fish stocks and highly migratory fish stocks (see A/CONF.210/2006/15, annex, paras. 46-49; see also ICSP2/UNFSA/REP/INF.1, annex II).

289. *Regional Fisheries Management Organizations.* RFMO/As are recognized as the primary mechanism for international cooperation in conserving and managing fishery resources, including straddling fish stocks and highly migratory fish stocks. Many RFMO/As have incorporated provisions of the 1995 Fish Stocks Agreement in their constitutive agreements, or have adopted measures in practice to implement the Agreement. Additional work is needed, however, to advance the implementation of the Agreement through RFMO/As.

290. The need to update, strengthen and modernize the mandates and competencies of RFMO/As has also been widely accepted, as well as the need to address gaps in the geographic coverage of RFMO/As beyond areas of national jurisdiction, including areas where there are no RFMO/As, and areas where RFMO/As are only competent to manage certain fish stocks (see A/CONF.210/2006/15, annex, paras. 9, 10 and 29; see also A/59/298, para. 150).

291. *(i) Gaps in geographic coverage.* UNCLOS and the 1995 Fish Stocks Agreement provide, inter alia, for the establishment of RFMO/As in areas where they do not exist. In 2004, it was reported that the principal gaps in coverage of existing RFMO/As with respect to straddling fish stocks, highly migratory fish stocks, and discrete high-seas fish stocks, were: the South-East Pacific for all fish stocks; and the Caribbean, Indian Ocean, South-West Atlantic, South-East Pacific and West Central Pacific for straddling fish stocks and discrete high-seas fish stocks (see A/59/298, paras. 150-151; and A/58/215, paras. 34-39).

292. Since that report, conservation and management measures have been adopted in the context of the newly established SEAFO and the Western and Central Pacific Fisheries Commission. In 2005, FAO established a new regional fisheries body, the

[124] A/CONF.210/2006/15, annex, paras. 2, 5, 7, 11 and 14; see also the FAO International Plan of Action for the Management of Fishing Capacity.

South West Indian Ocean Fisheries Commission, and on 7 July 2006, the South Indian Ocean Fisheries Agreement was adopted (see A/61/154, paras. 187-192).

293. Cooperative efforts are also being undertaken to establish a new RFMO in the South Pacific Ocean, which will provide for the conservation and management of non-tuna species, including deep sea stocks. Regional cooperation is also ongoing to establish a new mechanism to regulate high seas bottom fisheries in the North-Western Pacific Ocean. Measures have been adopted in respect of these two areas to implement interim conservation and management measures (ibid., paras. 193-200, and A/62/260, para. 156; see also paras. 71-73 above).

294. *(ii) Expanding competencies of RFMO/As.* Also important is the need for RFMO/As to update existing sectoral mandates and expand their competencies to manage all fish stocks within their jurisdiction. In the latter respect, the need to address the conservation and sustainable use of discrete high seas fish stocks has been well recognized. Concern has also been expressed over the conservation and sustainable use of deep water fish stocks, particularly in respect of bottom fisheries (see paras. 23-25, 72-73 and 301-302 of the present report).[125]

295. The Review Conference agreed that RFMO/As with competence to regulate straddling fish stocks also have the necessary competence to conserve and manage high seas discrete stocks, and that there was no obstacle for these RFMO/As to adopt management measures in respect of such stocks in accordance with the general principles set forth in the Agreement (see also para. 298 below).[126]

296. More recently, the General Assembly has called upon States and RFMO/As with competence over discrete high seas fish stocks to adopt the necessary measures to ensure the long-term conservation, management and sustainable use of such stocks. It has also called upon States and RFMO/As to collect and report required catch and effort data and fishery-related information for discrete high seas fish stocks, or establish processes to strengthen such data collection and reporting (see General Assembly resolution 61/105, paras. 8 and 19).

297. *(iii) Modernization of RFMO/As.* Another issue is the need for RFMO/As to update and strengthen their constitutive instruments and provide for modern fisheries management tools to ensure the conservation and sustainable use of fish stocks, in particular the precautionary approach and the ecosystem approach, and for management decisions to be based on the best scientific information available. The extent to which the precautionary approach is being implemented in practice varies widely. Many RFMO/As have adopted measures to minimize the catch of non-target and associated and dependent species, but the scope and effectiveness of these measures could be improved. Efforts to implement an ecosystem approach to fisheries management have also increased in recent years, but accelerated progress is needed (see A/CONF.210/2006/15, annex, paras. 8 and 13).

298. At the first meeting of the Working Group, some States questioned whether RFMO/As had the capability or competence to adopt holistic approaches in the management of fisheries, since many were single-species management

[125] See A/CONF.210/2006/1, paras. 104-116. Most known discrete high seas fish stocks are deep water species, but some may be pelagic.

[126] See A/CONF.210/2006/15, annex, para. 16. A number of RFMO/As have the competence to manage discrete high seas stocks, and some have adopted conservation and management measures which apply to these stocks (see A/62/260, paras. 22-23).

organizations, or to tackle current issues, including destructive fishing practices (see also paras. 72-74 and 301-302 of the present report). Some States noted that existing mechanisms provided only sectoral governance structures and there were no clear mechanisms or policy approaches in place to foster cooperation and coordination in a way that could effectively address conservation of certain sensitive marine ecosystems. Different views were also expressed on whether there was a need for new institutions and legal frameworks to address specific problems and vulnerabilities. It was suggested that such a holistic approach could be based on multiple-use protected areas for vulnerable and unique habitats (see A/61/65, paras. 25 and 33).

299. Many RFMO/As have reported taking steps to incorporate or implement modern approaches and tools in international fishery instruments, including by amending their constituent instruments, with a view to strengthening their mandates and functions (see A/62/260, paras. 16 and 165; see also A/CONF.210/2006/1, sect. III.A). Progress in this regard has been mixed, however. The Review Conference called on States and RFMO/As to continue on an urgent basis to strengthen the mandates of, and measures adopted by, RFMO/As to implement modern approaches to fisheries management (see A/CONF.210/2006/15, annex, para. 32 (a)). The General Assembly has also called on all States and RFMO/As to apply widely the precautionary approach and an ecosystem approach to the conservation, management and exploitation of fish stocks, including the implementation of the provisions of article 6 of the Agreement (see resolution 61/105, para. 5).

300. In light of these concerns, RFMO/As have also been called upon to undergo performance reviews to assess the adequacy of their overall management against the benchmark provided in the 1995 Fish Stocks Agreement and other relevant instruments, including best practices of RFMO/As, and to make the findings publicly available (ibid., para. 70; see also A/CONF.210/2006/15, annex, paras. 32 (j) and (k)). Some regional organizations such as the North East Atlantic Fisheries Commission (NEAFC) and NAFO have indicated that they have completed such reviews and have made amendments to their respective conventions, while other RFMO/As are expected to undertake such reviews in the future (see A/62/66, para. 112).

301. *Impacts of fishing on vulnerable marine ecosystems*. This issue has recently received considerable attention from the General Assembly (see resolution 59/25, paras. 66-69 and 71; resolution 60/31, paras. 73-74; and document A/61/154) and States and RFMO/As have adopted a wide range of measures to address the impacts of destructive fishing practices on vulnerable marine ecosystems both in areas within and beyond national jurisdiction[127] (see also paras. 72-74 above). At its sixty-first session, the General Assembly called on States, inter alia, to take action immediately, individually and through RFMO/As, to sustainably manage fish stocks and protect vulnerable marine ecosystems from destructive fishing practices, and to

[127] Measures include management of fishing capacity; prohibition of certain fishing practices, in particular in areas with vulnerable ecosystems; restrictions on gear types and their use in certain areas; measures to address by-catch; measures to improve control by flag States over their vessels fishing on the high seas; measures to improve monitoring, control and surveillance, compliance and enforcement; measures to address IUU fishing; data collection and research; establishment of marine protected areas, and more extensive use of scientific advice.

adopt and implement measures to regulate bottom fisheries (resolution 61/105, paras. 80-90). With respect to the regulation of bottom fisheries in areas beyond national jurisdiction, paragraph 83 of resolution 61/105 called upon RFMOs with the competence to regulate bottom fisheries to adopt and implement measures, in accordance with the precautionary approach, ecosystem approaches and international law, to regulate bottom fishing activities beyond areas of national jurisdiction.

302. The Assembly will conduct a further review in 2009 of the actions taken by States and RFMOs in response to relevant provisions in resolution 61/105, paragraph 91. Also relevant in this respect are the activities of the FAO to address deep sea fisheries issues and develop technical guidelines for the management of deep sea fisheries in the high seas, including standards and criteria for use by States and RFMO/As in identifying vulnerable marine ecosystems and the impacts of fishing activities on these ecosystems (see A/62/260, para. 94).

303. *Strengthening compliance and enforcement.* Effective compliance and enforcement of conservation and management measures, supported by effective monitoring, control and surveillance, is critical to achieving the long-term conservation and sustainable use of fish stocks. Flag States have the primary role in enforcing conservation and management measures over vessels flying their flag on the high seas. In this respect, flag States must ensure compliance by their nationals with measures adopted by RFMO/As if those organizations are to effectively discharge their mandates and manage fish stocks.[128] A key obligation is for flag States to ensure that their vessels only fish in areas where they are a member of the RFMO/A or have agreed to apply the measures adopted by the RFMO/A. Wider acceptance and effective implementation of the 1995 Fish Stocks Agreement and other international fishery instruments, including the FAO Compliance Agreement and the Code of Conduct, are also key (see A/58/215, paras. 23-27).

304. States and RFMO/As have adopted a wide variety of measures in this respect, including licensing and authorization of vessels, positive and negative lists of vessels, high-seas boarding and inspection, alternative mechanisms, observer programmes, trade tracking or catch documentation schemes, vessel monitoring systems, registers of fishing vessels, and trans-shipment. Port State control has also developed as a complementary jurisdiction for ensuring compliance with the conservation and management measures of RFMO/As, and port States measures or schemes have been developed to promote compliance with measures of RFMO/As (see A/CONF.210/2006/15, annex, paras. 35 and 40; and A/62/260, sect. V.B.1, (see also paras. 178 and 180 above).

305. However, IUU fishing remains a significant problem. Those engaged in IUU fishing activities are able to exploit differences or deficiencies among the monitoring, control and surveillance measures adopted by States and RFMO/As in order to escape detection or to avoid compliance.

306. In response to these concerns, the Review Conference called on States, individually and through RFMO/As, to strengthen effective control over vessels

[128] A/CONF.210/2006/15, annex, paras. 33, 35, 36 and 39. The duties of flag States are clearly set out in the 1995 Fish Stocks Agreement, the FAO Compliance Agreement, and the FAO International Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing.

flying their flag and ensure that those vessels comply with, and do not undermine, conservation and management measures adopted by RFMO/As and to adopt, strengthen and implement compliance and enforcement schemes in all RFMO/As, enhance or develop mechanisms to coordinate monitoring, control and surveillance measures, and ensure the fullest possible exchange of monitoring control and surveillance information related to IUU fishing activities (see A/CONF.210/2006/15, annex, paras. 37 and 43 (a) and (b)). The Review Conference also called for the adoption of all necessary port State measures to combat IUU fishing and for the development of a legally binding instrument on minimum standards for port State measures, which is now being undertaken by the FAO (ibid., para. 43 (d); see also A/62/66/Add.1, para. 117).

307. Further work is needed by RFMO/As to adopt comprehensive monitoring, control and surveillance schemes and to combat and deter IUU fishing activities (see A/CONF.210/2006/15, annex, para. 35; see also paras. 321-322 below).

(b) Other marine species

308. Many other marine species are particularly vulnerable to the impacts of by-catch, either from incidental catch, discards, and marine debris, including cetaceans, marine turtles, seabirds and sharks (see paras. 20, 25, 39 and 45 above). Owing to the large distances that they travel for breeding and feeding purposes, migratory species are also particularly vulnerable to human activities in the oceans (see paras. 148-149 above).

309. The conservation of these species is the subject of a number of international instruments (see, for example, paras. 148-149 above). In this respect, implementation of the regional agreements concluded under the Convention on the Conservation of Migratory Species of Wild Animals, such as the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area and the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas, is crucial. Particular attention is being paid, in this context, to incidental taking of species, development of conservation plans, and consideration of measures to mitigate the impacts of ocean noise (see A/62/66/Add.1, paras. 148-150 and 192-193). Consideration should also be given to gaps in the geographic coverage of these instruments, in order to ensure that concerned species are protected throughout their migratory range.

310. In relation to sea turtles, implementation by States and RFMO/As of the FAO Guidelines to Reduce Sea Turtle Mortality in Fishing Operations is far from complete. Although some progress is being made by some regional organizations and by individual States, overall formal commitment and actual implementation of the FAO Guidelines is not yet standard in the fisheries commissions for which turtle by-catch may be an issue (ibid., paras. 152-153).

311. With respect to whales, which are addressed under the International Convention on the Regulation of Whaling, recent discussions have taken place on the future direction of the International Whaling Commission, which has a dual mandate of both conserving whale stocks and managing whaling. While further work is needed in this regard, the International Whaling Commission itself has recognized positive overlaps in the outcomes of three non-Commission meetings in 2006 and 2007 (ibid., para. 141).

4. Protection and preservation of the marine environment

312. The fundamental principles provided in UNCLOS for the prevention, reduction, and control of pollution from all sources are supplemented by reference to internationally agreed rules and standards. This mechanism allows for the regular review, updating and amendment of rules and standards to also keep pace with changes in scientific and other knowledge of the marine environment. The obligations in UNCLOS for the protection and preservation of the marine environment in part XII are thus complemented by a number of other international instruments.

313. The General Assembly has emphasized the importance of the implementation of part XII of UNCLOS in order to protect and preserve the marine environment and its marine living resources against pollution and physical degradation. In this respect, the Assembly has called upon all States to cooperate and take measures consistent with the Convention, directly or through competent international organizations, for the protection and preservation of the marine environment, and it has encouraged States to adopt the necessary measures aimed at implementing and enforcing the rules contained in international agreements addressing the safety and security of navigation (General Assembly resolution 61/222, paras. 50 and 74).

314. As contemplated by article 197, a number of regional seas conventions and action plans also address the protection of the marine environment (see A/62/66, paras. 299-323 and A/59/62/Add.1, paras. 279-287) and offer a valuable platform for regional implementation of global programmes and initiatives, international agreements, and programmes of work of international organizations aimed at the sustainable management and the protection of the marine environment, including agreements, programmes and initiatives related to ship-generated and marine-based pollution (see A/59/63, paras. 142 and 144). Further cooperation is needed in the formulation and elaboration of international rules, standards and recommended practices and procedures for the protection and preservation of the marine environment (see para. 104) (see A/59/62/Add.1, paras. 280 and 281).

315. In recent years, the attention of the international community has focused on the development and implementation of international instruments to protect and preserve the marine environment from land-based activities and shipping activities because of the threat they pose to the health, productivity and biodiversity of the marine environment (see paras. 28-50 above). The present section reviews some recent issues raised in relation to the protection and preservation of the marine environment beyond areas of national jurisdiction, in particular with respect to shipping activities.

316. *Land-based activities*. The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) has a particularly important role in preventing the degradation of the marine environment from land-based activities, including by addressing the interaction between land and oceans, and in integrating freshwater with coastal and marine management approaches. Approximately 70 States have developed or are in the process of developing national plans of action for the implementation of GPA, but further efforts are needed in this regard (see A/62/66/Add.1, paras. 172-174).

317. The second session of the Intergovernmental Review Meeting on the Implementation of the Global Plan of Action for the Protection of the Marine

Environment from Land-based Activities considered progress in implementation of GPA and identified options for strengthening its implementation. Major themes emerged for improved implementation at the national level, including the need for cross-sectoral partnerships, use of an ecosystem approach, coordination between national programmes and regional environmental efforts, and scientific basis for action through ongoing monitoring of the marine environment. The GPA Coordination Office has prepared several publications to improve implementation of GPA, including by recommending actions, practices and procedures in relation to ecosystem approaches (see A/62/66, paras. 269 and 271; and A/62/66/Add.1, para. 174).

318. *Shipping activities*. UNCLOS and several global conventions developed under the auspices of IMO, as well as other legal instruments, provide measures to protect and preserve the marine environment from shipping activities. As noted in paragraph 283 above, it is important for States to become party to relevant international instruments and, where necessary, review the existing instruments. Some of the IMO conventions are regularly reviewed as to their effectiveness and amended, as necessary. For example, annex V to MARPOL 73/78 is currently being reviewed as regards its effectiveness in addressing sea-based sources of marine debris.

319. Flag States are responsible for ensuring that the regime for the safety of navigation and the protection and preservation of the marine environment beyond areas of national jurisdiction, as provided for in UNCLOS and relevant IMO conventions and other legal instruments, is effectively implemented and enforced.[129] Lack of effective control can pose a threat to the safety of navigation and the marine environment. It has been observed that many shipping accidents and resulting pollution are not the result of inadequate regulation at the global level, but rather the direct result of ineffective flag State implementation and enforcement. Further, it has been suggested that the solution may not lie in the adoption of more rules, but rather in ensuring that existing rules are effectively enforced (see A/58/65, paras. 36 and 37).

320. The Johannesburg Plan of Implementation of the World Summit on Sustainable Development, in paragraph 34, urged IMO to consider stronger mechanisms to secure the implementation of IMO instruments by flag States. In this regard, a number of initiatives have been recently taken. For example, IMO has developed a Voluntary Member State Audit Scheme to improve flag State performance, which involves independent audits to be performed on States. It also developed a Code for the Implementation of Mandatory IMO Instruments, which provides the audit standard for the Scheme. The objective of the Scheme is to provide an audited member State with a comprehensive and objective assessment of how effectively it administers and implements IMO conventions relating to maritime safety and

[129] For a detailed list of flag State obligations under UNCLOS and other instruments, see A/59/63, sect. III.

prevention of marine pollution, and how technical assistance can be provided to help introduce improvements following an audit.[130]

321. Although exercise of effective control by flag States over ships flying their flag is critical to ensure the implementation and enforcement of the relevant provisions of UNCLOS and other instruments, taking action to eliminate a sub-standard ship from a shipping registry may not prevent the owner from finding another accommodating flag State. The Ad Hoc Consultative Meeting of senior representatives of international organizations on the subject of the "genuine link" emphasized that international regulatory regimes should be complemented by a sound economic framework providing incentives to ship owners and operators to comply with such regimes, combined with an effective enforcement and compliance strategy that would ensure effective flag State supervision of ships and the imposition of adequate sanctions in cases of non-compliance. It also underlined the need for ongoing compliance with international regulations wherever a ship is operating, irrespective of registry or flag, and the importance of developing a "compliance culture". The Meeting suggested, for example, that a joint model course on flag State implementation covering all flag State responsibilities falling within the mandates of the various agencies, might be useful (see A/61/160, annex, paras. 13 and 51-53).

322. The General Assembly has urged flag States without an effective maritime administration and appropriate legal frameworks to establish or enhance the necessary infrastructure, legislative and enforcement capabilities to ensure effective compliance, implementation and enforcement of their responsibilities under international law. Moreover, the Assembly has urged flag States to consider declining the granting of the right to fly their flag to new vessels, suspending their registry or not opening a registry until such action is taken. The Assembly has also called upon flag and port States to take all measures consistent with international law necessary to prevent the operation of substandard vessels (see General Assembly resolution 61/222, para. 71).

323. As noted above, it is the duty of flag States to ensure that ships meet internationally agreed safety and pollution prevention standards and effective flag State control is essential in this respect. However, port States have a complementary role, which constitutes an important and increasingly relied upon mechanism for the enforcement of relevant conventions. From this perspective, port State jurisdiction is largely a corrective mechanism, aimed at addressing non-compliance with or ineffective flag State enforcement of relevant instruments (see A/58/65, para. 92).

324. Port States have a more limited role in relation to safety of navigation and the protection and preservation of the marine environment beyond areas of national jurisdiction. Notable is the provision in article 218 of UNCLOS providing for port

[130] See A/61/160, annex, para. 30. Since September 2006, 31 States have volunteered for the audit and 12 audits have been successfully completed as of 22 April 2007. See also A/62/66/Add.1, para. 72. Other IMO measures include Guidelines to Assist Flag States in the Implementation of IMO Instruments (resolution A.847(20)), and resolutions on guidance to assist flag States in the self-assessment of their performance (resolution A.912(22)), and on measures to further strengthen flag State implementation (A.914(22)). Under the International Safe Management Code, companies operating ships are subject to a safe management system under the control of the administration of the flag State.

States to take action in respect of any discharge from a vessel outside areas of national jurisdiction in violation of international rules and standards.

325. However, the role of port States in inspecting foreign ships to verify that the condition of the ship and its equipment comply with the requirements of relevant international regulations has been expanding. Initiatives are being taken by IMO to improve port State control and harmonize port State control activities. Regional instruments have also developed to coordinate port State control activities, such as the Paris and Tokyo Memorandums of Understanding (see A/62/66, paras. 60 and 61). It is expected that the role of port States will increase with new responsibilities for ensuring compliance with maritime security regulations by vessels, and for the inspection of fishing vessels to ensure compliance with conservation and management measures (see para. 180 above; see also A/58/65, para. 92).

VII. Conclusions

326. Biodiversity, including marine biodiversity, is at the heart of healthy ecosystems and is essential to global food security and sustainable livelihoods, economic prosperity and a healthy environment. For example, the sustainable provision of genetic information, a driver of innovation and biodiscovery, is directly dependent on the conservation of biological resources and their diversity, including the dynamic ecosystems in which these resources evolve.

327. Currently, the individual as well as cumulative effects of anthropogenic activities, such as, overfishing, destructive fishing practices, pollution and human-induced climate change, are contributing to the loss of marine biodiversity and decreasing the benefits that humans can derive from the oceans. It is therefore important to manage anthropogenic activities to ensure that the services provided by marine ecosystems continue to support human needs in the long term. It is also important to address gaps in information of the state, resilience and vulnerability of the marine environment and of the nature and extent of activities which impact marine biodiversity.

328. A variety of area-based management tools currently mostly available for areas within national jurisdiction could also be further implemented in areas beyond national jurisdiction to provide a higher level of protection to some species and habitats by managing the activities which negatively impact marine biodiversity or that have such potential. While some tools are specific to sectors, such as shipping and fisheries, others, often described collectively as "marine protected areas", adopt integrated and ecosystem-based approaches which address cumulative impacts of various activities and user conflicts and integrate ecological and socio-economic considerations in decision-making.

329. A crucial element for the implementation of area-based management tools is cooperation and coordination among States, either directly or through relevant international organizations. Implementation also needs to be based on scientific information, an integrated approach, lessons learned at the national level, and the objectives being pursued, as well as the specific characteristic of the area.

330. Cooperation among States, either directly or through relevant international organizations, is also an essential element of the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction. It is therefore important to

improve international cooperation and coordination, including better linkages between agencies and organizations addressing different sectors. In this respect, States could consider harmonizing the mandates of relevant organizations by building on the existing mandates, integrating the respective areas of expertise and avoiding duplication of work, and thereby ensuring a coordinated approach to their activities. Further cooperation and coordination across sectors could be promoted to achieve an integrated ecosystem-based approach to ocean management and the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction.

331. The need for international cooperation to support marine scientific research, for example, through exchange and dissemination of information, has been particularly highlighted. Only a fraction of the Earth's oceans, in particular beyond areas of national jurisdiction, has been explored and information is still limited on the status, distribution, function and vulnerability of marine biodiversity and biological resources, particularly marine genetic resources. It is therefore important to strengthen the information base with specific data. Further scientific studies are essential to improve the understanding of marine biodiversity and thereby facilitate better informed policy and decision-making for the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction. In that regard, the importance of international cooperation to increase the capacity of developing countries to conduct scientific research has been underlined, in particular the exchange and dissemination of scientific information, participation in research activities, development of new technologies, funding for studies, and strengthening of taxonomic expertise.

332. Knowledge of current and potential benefits of marine genetic resources in terms of the supporting, regulating and provisioning services they provide also points to the need for increased research and further studies, including on the role of intellectual property rights, as well as for assessments of the current capacity of countries to benefit from those resources, including through marine biotechnology. A uniform understanding of the applicable legal regime is likely to encourage research in areas beyond national jurisdiction. It may counterbalance the risks associated with the significant financial investment and advanced technology needed for deep sea activities.

333. A priority is to increase the level of participation in and implementation of existing instruments, including the principles and tools available to address the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction. Capacity-building plays an important role in this regard. Improvement in implementation also needs to be carried out in conjunction with an effort to improve cooperation and coordination among existing mechanisms, international organizations, and sectors and regimes with varying competencies beyond areas of national jurisdiction, as well as capacity-building.

334. During recent discussions in international forums, issues or concerns have been raised in relation to the existing legal framework for the conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction, including the question of governance and regulatory gaps. A range of solutions have also been offered to address these issues with varying levels of support. Proposals include the need to focus on strengthening the implementation of, compliance with and enforcement of the existing legal regime; addressing specific gaps in

implementation; and the development of new legal instruments or mechanisms to enhance cooperation for the integrated conservation and sustainable use of marine biodiversity beyond areas of national jurisdiction. The question of whether there is a governance or regulatory gap in the existing international legal framework is ultimately a question of policy. It will be for States to decide on the way forward, bearing in mind that the legal framework for all activities in the oceans and seas is set out in UNCLOS.